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Selected E-Waste Diversion in California: A Baseline Study

November 2001

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Integrated Waste Management Board

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Executive Summary

Background

In June 2001, the California Integrated Waste Management Board (CIWMB) contracted with a management consulting firm to conduct a baseline diversion study for electronic waste (e-waste). Interest for this study was spurred, in part, by a letter issued by the Department of Toxic Substances Control (DTSC) clarifying State regulations that require cathode ray tubes (CRT) to be managed as a hazardous waste, and that prohibit disposal of CRTs in municipal solid waste landfills. It is expected that this clarification of regulations will result in an increase in the need for CRTs to be diverted from landfills.

Study Purpose and Focus

The purpose of this study was to provide the Board with data about e-waste volume, processing capacity, and diversion cost estimates so that the Board may make informed decisions regarding possible steps necessary to address the impact of the State regulations and other economic concerns. Under the guidance of a Board e-waste steering committee, the study focused on particular items within the e-waste diversion stream in order to provide more depth to salient issues, rather than less information on many topics. Accordingly, the study examined:

- Diversion, not disposal or total e-waste generation.[♦]
- Central processing units (CPU) and CRT-containing televisions and computer monitors, not all types of e-waste.
- Primary and secondary processors within the diversion market, not the "go-betweens" who are collectors and transporters of e-waste.[▽]

The steering committee developed five research questions to help focus and guide the study. In order to answer these questions, surveys were conducted of processors and residents, and responses were extrapolated to statewide data estimates.

Summary Findings

Future Volume of CRTs Exceeds Current Capacity to Process Them

The research findings show a gap exists between the current processing capacity and the projected volume of diverted CRTs for 2006. Alternatively, the current capacity to process CPUs exceeds the future volume of diverted CPUs. In its entirety, the capacity shortfall reflects a difference of thousands of tons of e-waste and millions of dollars in additional cost to process that waste.

[♦] In this report, the term "diversion" refers to managing e-waste in such a way that it does not enter the solid waste stream—i.e., landfills—where toxic substances can leach into the ground and impact air and water quality. In this report, the alternative to diversion is disposal—the process of discharging e-waste into the solid waste stream.

[▽] Primary processors are those who refurbish or repair items for resale or re-sell the item as is, while secondary processors are those who de-manufacture (dismantle) products in order to recover raw materials.

Processors Predict a Smaller Increase in Processing Volume Than Historical Trends Would Predict

Processors are predicting a lower volume to be processed in 2006 than historical trends would indicate. For most e-waste types and processing types, processors' self-reported projections represent the lower end of the projected volume range. This lower volume projection may, in part, reflect a loss of some processors from the future processing market. Survey responses showed that 25 percent of primary processors and 14.3 percent of secondary processors included the elimination of handling these materials as a factor in their volume projections.

Some Processors Deterred From Handling CRT-Containing E-Waste

Verbal and written feedback from some processors indicates a desire to move away from processing CRT-containing televisions and computer monitors as a result of the costs associated with CRT handling requirements. According to these processors, profit margins to process televisions were slim before it was clarified that CRTs must be handled as a hazardous waste. With the understanding that dumping CRTs in landfills is not a disposal option, the additional costs to transport and handle CRT-containing e-waste makes them less attractive to processors.

Conclusions

While these findings indicate there may be a reduction in the overall number of processors in the future, it is not clear how this decrease will impact actual processing capacity in California. Large processors may be able to absorb the capacity lost to smaller processors exiting the market. However, opportunities to divert e-waste at a local level may be limited by the loss of diversion outlets such as thrift stores.

The loss of local, convenient diversion outlets could seriously bottleneck the flow of e-waste to secondary processors. Although local collection programs, whether administered by government or private business, may be able to compensate for some of this reduction in diversion capacity, they are constrained by the same cost considerations as thrift stores. At this time, it is unlikely that either public or private local collection programs would consider expanding their efforts into the e-waste diversion market because of high handling and transportation costs.

The Board's policy decisions will benefit from continued monitoring of shifts in the e-waste market and factors causing these shifts. This information will help the Board to know, for example, if and where more collection opportunities need to be implemented, or whether the capacity of secondary processors needs to be shored up before residents are informed of new diversion opportunities or encouraged to deplete their stockpiles.

Considerations

The conclusions drawn reflect the period of study for this report—that is, through calendar year 2006. The Board should be aware of factors that affect both the supply of e-waste (volume) and the demand for e-waste (capacity) beyond the years of this study. Additionally, the projections in the findings do not reflect the impact of actions the Board and other government agencies may take *within* the next five years, such as encouraging a release of stockpiled items or changing regulations that may impact the market further. The Board needs to be cognizant of how these actions and related issues can impact California's ability to successfully divert e-waste.

The following factors may affect e-waste volume and processing capacity in California:

- Sales volume continues to be large.[♦]
- Shifts in householders' behaviors can affect volume of e-waste being diverted.
- New federal prison may accept e-waste, thereby increasing capacity.
- More processors may be identified through reporting requirements, thereby refining capacity numbers.

[♦] Sales and product data are insufficient to predict when a product will become e-waste and therefore cannot be used to predict diverted volume. Also, technology trends will not alter CRT-containing e-waste volume in the near term.

Introduction

In June 2001, the California Integrated Waste Management Board (CIWMB) contracted with a management consulting firm to conduct a diversion study for specified electronic waste (e-waste). An e-waste steering committee consisting of CIWMB Executive and Board staff guided the consultant throughout the engagement. This report is the product of that study.

Background

There has been a growing national dialogue regarding the rapidly increasing volume of e-waste entering the solid waste stream and its potential environmental impacts. E-waste as a broad category may contain hazardous materials such as lead and mercury. Unwanted or broken televisions, computer monitors, central processing units (CPU), cordless phones, cash registers, videocassette recorders, cell phones, copiers and printers, stereos and speakers, microwaves, x-ray machines, some scientific equipment, and other electronic devices are all considered e-waste.

Televisions and computer monitors have been the focus of more intense scrutiny recently because they contain cathode ray tubes (CRTs) with significant amounts of toxic materials including lead, barium, mercury, and cadmium, which can pose public health risks.[1] Additionally, because personal computers become obsolete so quickly, CPUs (which contain lead, mercury, and other toxic materials[2]) are also being looked at closely.

The following regulatory developments have impacted CRT management in California in the last year:

- March 2001: In a letter to the Materials for the Future Foundation (MFF),[3] the Department of Toxic Substances Control (DTSC) clarifies that "CRTs meet the existing hazardous waste criteria and should be handled as hazardous waste." This letter does not change existing regulations ♦ in any way; however, this letter increases public awareness that CRTs are hazardous waste and may not be disposed of in municipal solid waste landfills.
- August 2001: DTSC adopts emergency regulations classifying CRTs as universal waste. This change reduces the management requirements for CRTs in California to the minimum permissible under federal law, but maintains the prohibition on landfill disposal.

Based on some processors' verbal and written feedback, 2001 has been a tumultuous year. Despite California's longstanding regulations regarding appropriate management of hazardous waste, it appears that an understanding of the implications of these regulations by those who generate and process CRTs was not widespread until the clarifying letter to MFF in March of this year. Consequently, costs associated with treating CRTs as hazardous waste have only recently been felt.

Although the emergency regulations adopted in August sought to lessen both the cost and the burden of handling CRTs, survey respondents did not report either effect. This could be because processors were not yet aware of the new regulations, had not recognized the full benefits of the new regulations, or had not yet changed operations to capitalize on the new regulatory structure.

♦ Division 20, Chapter 6.5 of the Health and Safety Code

Scope of Services

The purpose of the study was to provide the Board with data about e-waste volume and processing capacity and cost estimates so that the Board may make informed decisions regarding steps that may need to be taken to address the changing economics of e-waste management. The Scope of Work was developed by CIWMB staff and approved by the Board in April 2001. The consultant was required to identify processors' current capacity, future volume, and projected costs of processing the additional e-waste volume expected in 2006. From this information, the consultant was to determine whether the current infrastructure could manage the projected volume, and if not, what the cost would be to process the expected additional volume.

Study Focused on Diversion, Not Disposal

In order for the Board to have more detailed information that would help them make decisions for future diversion activities, the steering committee decided that this study should examine particular stakeholders and certain e-waste types within California's diversion market—not e-waste disposed[♦] of in landfills, or the total volume of e-waste generated by households, business, or the public sector.

Study Focused on CRT-Containing Televisions and Computer Monitors and CPUs

The Scope of Work indicated that the e-waste types for the study might include computer monitors, televisions, cordless phones, videocassette recorders and DVDs, cell phones, copiers and printers, stereos and speakers, microwaves, and other electronic devices. After much discussion, the steering committee determined that the study should focus on CRT-containing televisions and computer monitors and CPUs to enable the collection of a significant amount of information on a few e-waste products rather than less information on more e-waste products. These three e-waste types were selected because of their potentially hazardous nature and because the market for these items is adjusting to the state's changing regulatory environment.

Study Focused on Primary and Secondary Processors in the Processing Chain

Within the diversion market, the scope of processing types is confined to primary and secondary processors. Primary processors are defined as those who refurbish or repair items for resale or re-sell the item as is, while secondary processors are those who de-manufacture (dismantle) products in order to recover raw materials. The report does not include entities that collect or transport waste, such as landfill operators, household hazardous waste facilities, local government collection programs, and haulers, or entities that solely export e-waste and do not process it in some way. The steering committee's interest in focusing on the entities that actually re-sell and recycle e-waste, rather than the "go-betweens," reflects a concern that these processors have the greatest potential for causing a bottleneck for diversion.

Five Questions Developed to Focus Research

The steering committee developed five research questions to help focus and guide the study. These questions were designed to provide the Board with the answers they need to determine what actions, if any, will be necessary to handle the expected increase in CRT-containing

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♦ In this report, the term "disposal" refers to discharging e-waste into the solid waste stream—i.e., landfills—where toxic substances can contaminate the ground, air, and water. In this report, the alternative to disposal is diversion—the process of managing e-waste so that it does not enter the solid waste stream.

televisions and computer monitors, and CPUs being diverted from landfills over the next five years. These research questions are:

1. In calendar year 2001, what is the capacity in California to process CRT-containing televisions and computer monitors, and CPUs, by processing type?
2. In calendar year 2006, what will be the projected range of CRT-containing and CPU e-waste volume in California, by e-waste type?
3. Can the current infrastructure (as determined by the answer to question 1) handle the volume of CRT-containing televisions and monitors and CPUs as projected for calendar year 2006, by e-waste type and processing type?
4. What is the projected range of cost to manage the additional volume of e-waste as projected for calendar year 2006, by e-waste type and processing type?
5. What is the current volume of the residential stockpile of CRT-containing televisions and monitors in California?

Methodology

Various methods were used to generate estimates for this report. This section details how these data were derived.

Background

Reports on E-Waste Reviewed to Provide Context

To gain an understanding of the issues surrounding e-waste, the consultant reviewed background information provided by Board and Executive staff. A list of those sources can be found in the bibliography. Appendix F also provides a listing of publications and groups as additional resources.

Capacity, Volume, and Cost

List Compiled From Many Sources to Identify Universe of California Processors

A list of potential primary and secondary processors was created by combining existing contact lists from the CIWMB, DTSC, and the Silicon Valley Toxics Coalition. Those lists were then supplemented by processor information provided on Web sites of the Electronics Industry Alliance, TechSoup, International Association of Electronic Recyclers, and the National Recycling Coalition.[4] Goodwill and Salvation Army stores were then added to complete the list. Through this process, 591 primary and secondary processors were identified.

Processors Surveyed to Identify Capacity, Volume, and Cost

The consultant, with the input of the steering committee, developed a written survey for e-waste processors to identify current capacity, projected future volume, and existing costs for specified e-waste types. The survey was mailed to the 591 processors. Processors were invited to submit their responses to the consultant's Web site, or to provide responses on paper, which were then returned to the CIWMB or to the consultant. Appendix A provides the survey questions and Appendix B contains a summary of responses.

List Refined Through Telephone Contact

To encourage a higher response rate to the survey, the consultant made multiple attempts to contact the processors. During the telephone contacts, the consultant was made aware of five additional processors not originally identified, bringing the grand total of potential processors to 596. Of this number, 214 processors were directly contacted, while information on the other 382 (representing the Salvation Army and Goodwill stores) was obtained by contacting their regional offices.

The consultant found that of the 596 processors, 103 of the contacts did not process the specified e-waste items, were no longer in business, or could not be located. Therefore, other than Goodwill and Salvation Army stores, 111 primary and secondary processors were identified in the state. This is likely the most comprehensive and recent list of California processors and, for the purposes of this study, represents the known universe.

Table 1 details how the consultant identified the known processors.

Table1
Known Processors

591	Processors originally identified
+ 5	Processors identified through telephone contacts
596	Processors in total identified
– 103	Processors no longer processed, not in business, or that could not be located
493	Viable processors
– 382	Goodwill and Salvation Army stores
111	Processors (other than Goodwill or Salvation Army) in the state

In making follow-up phone calls, the consultant also identified whether the processor was (1) solely a primary processor, (2) solely a secondary processor, (3) both processing types, (4) an existing business that does not process the specified e-waste, or (5) a seemingly defunct business. Of the 596 processors, 445 were primary only; 22 were secondary only; 26 were both types; and 103 were businesses that did not process specified e-waste or were apparently no longer in business. Appendix C contains the list of the 596 potential processors. Table 2 provides the profile of known processors.

Table 2
Profile of Known Processors

445	Primary processors only
22	Secondary processors only
26	Both primary and secondary processors
103	Not in the specified e-waste business or no longer in business
596	Grand total of contacts

Of the 493 viable processors identified, 26 individual survey responses were received in time for data analysis, for a response rate of 5.3 percent. A single response representing statewide figures for a thrift store chain was also received, itself representing 37 percent of all survey subjects. Two late responses from processors were received and were referred to for contextual value. Interestingly, some processors expressed reluctance to provide their market data to government, especially since the survey information was being requested in what processors view as an uncertain regulatory environment.

Three Sampling Models Used to Develop Statewide Estimates

In order to extrapolate statewide figures from survey responses for capacity, volume, and cost, three sampling models were built based on different processor characteristics. All three models were stratified by e-waste type (televisions, monitors, and CPUs) and processing type (primary and secondary).

- **Model 1: Large processors not dependent upon local market**

  One model was developed to derive figures for the large processors. These processors handled a significantly higher volume of e-waste than other processors and were not bound by a local market. Because the large processors in the state drive the statewide volume, survey follow-up with these processors was particularly aggressive, and a 61.5 percent response rate was obtained.

In order to extrapolate capacity and volume for each of the three e-waste types and two processing types, values from survey respondents were assumed for non-respondents based on the respondents' answers, except for televisions. Because few of the respondents handled televisions, the consultant tested the responses by following up with 100 percent of the large processors—even those who did not submit a survey—to ascertain participation in television processing.

- **Model 2: Processors dependent upon local resale and recycling markets**

  Smaller processors were examined as a distinct group. These businesses—closely tied to local resale and recycling markets—were more sensitive to the number of televisions, monitors, and CPUs being generated and discarded ♦ in their area. Therefore, for this group, the consultant built a model that stratified the list of processors into clusters that were based on regions of the state having similar numbers of computers per household. This proxy for the "e-waste market" was developed using computer ownership figures from the U.S. Department of Labor's *Current Population Survey Internet and Computer Use Supplement*.[5] Non-respondents were assigned the values of respondents, within the same cluster, e-waste type, and processing type.

- **Model 3: Thrift store chains reliant on donations**

  The third sampling group was thrift store chains. Thrift stores were treated as a distinct sampling group because they are charity organizations that receive donated items and therefore may face different market dynamics than for-profit processors. Thrift store data was also unique because one thrift store chain provided statewide figures, accounting for 37 percent of the entire list of processors in California.

All Responses Converted to Tons for Common Analysis

In order to compare, summarize, and analyze data from the processors' survey, all data was converted to a common metric—tons. A conversion ratio used by the National Safety Council (NSC) in its 1999 report was applied to any responses that were provided in units—specifically, each television was converted to 50 pounds, and each monitor and CPU was converted to 30 pounds, respectively.[6] Pounds were then converted to tons. The conversion ratios presented in Table 3 may be used to convert the volume figures presented in this report to pounds or units.

Table 3
Conversion Ratios

CRT Television	1 ton = 2,000 pounds = 40 televisions
CRT Computer Monitor	1 ton = 2,000 pounds = 66.66 monitors
Desktop CPU	1 ton = 2,000 pounds = 66.66 CPUs

These methodologies were used to extrapolate statewide figures from survey responses. However, additional calculations and estimates were developed in order to answer particular research questions. Additional details of these methodologies are presented below.

♦ In this report, "discard" means to relinquish an item that is no longer being used. The item, e-waste in this context, could be discarded in the solid waste stream (disposal), or discarded into the processing market (diversion).

Historical Average and Processor Self-Reporting Used to Develop 2006 Volume Estimates

To estimate the future volume of diverted e-waste, two forecasting models were developed using historical trends and processors' self-reported projections to create a range of projected 2006 volume. ♦ Processors were asked to report both their processing volumes from 1996 to the present and their own projections of processed volume through 2006.

- **Historical Average Forecast**

  The first model used historical volume changes as an indicator of future volume. After statewide estimates of historical volume were built from survey responses within the sampling models, a five-year average of the rate of volume change for each year between 1996 and 2001 was calculated and applied to the 2001 volume to create volume for 2002. This process was repeated through 2006.

- **Self-Reported Forecast**

  The second model applied processors' own projections for the volume processed in 2006 to build a statewide figure for future volume.

The biases of one model help to offset the biases of the other. For example, the "historical" forecast assumes that, on average, the future will look like the past. Assuming all things remain equal, this is a reasonable assumption. However, the environment of e-waste processing is a dynamic one, and processors have indicated that current changes in the environment are causing them to consider the impact on their future. Using processors' own predictions of the future helps to account for expected shifts in the market.

For purposes of these projections, the consultant assumed that the only variable that will change is the volume of diverted e-waste; all other market factors—transportation and handling costs, statute, regulation, the universe of processors—remain constant. Implications of changes to processing costs, statutes, regulations, and the universe of processors are discussed in the Considerations section of this report.

2001 Capacity and 2006 Volume Compared to Determine Gap

By comparing the capacity estimates with the projected volume ranges, the consultant determined whether a gap existed in the processors' current ability to handle the projected 2006 volume of each type of e-waste within each type of processing method.

Average Processing Cost Applied to Volume Gap to Calculate Cost of Processing Additional Volume

Processors were asked to report their total average processing costs for each e-waste type on the survey. No definition of "total processing cost" was provided for processors on the survey. Instead, processors were left to define their costs as they saw fit. As a result, self-reported

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♦ The estimate for the future volume (and subsequently the gap and cost) of televisions that will be processed by secondary processors does not have a range. In this case, only the self-reported forecast was used because the secondary market for televisions is dominated by a single large processor that entered the television market in the last few years. This processor's entry into the market and aggressive ramp-up affects the historical rate change in a dramatic way. To apply this rate change to the future would falsely assume that this processor's ramp-up would continue. Therefore, only the self-reported forecast model was applied to this e-waste and processing type.

processing costs may be more inclusive and therefore higher than an amount that a householder may by charged to drop off a CRT at the processor's site. For purposes of this report, costs could include those associated with hauling, processing, storage, and labor.

Survey responses were averaged, by e-waste type and processing type, to derive an average processing cost per ton. The 2001 consumer price index (CPI) inflator of 2.7 percent[7] was then applied to each year through 2006 to arrive at an estimate of future average cost in 2006 dollars. This inflation factor is another reason that costs used in this report would be higher than any reported *current* cost of processing e-waste. Where the gap analysis showed that future volume exceeded current capacity for a specific e-waste type and processing type, the consultant applied the average processing cost to the difference, to estimate a total cost to process the expected additional volume in 2006.

Table 4 presents the future average processing cost per ton, the common unit used to measure capacity and volume.

Table 4
Average Processing Cost
(in 2006 Dollars)

	Cost per ton
Televisions	
Primary Processing	$2,600
Secondary Processing	$1,700
Computer Monitors	
Primary Processing	$1,800
Secondary Processing	$1,100
CPUs	
Primary Processing	$1,500
Secondary Processing	$700

Stockpile Estimation

California Households Surveyed to Estimate the Number of Stockpiled CRTs

To identify Californians' stockpiling behavior and the volume of stockpiled e-waste items, the consultant worked with The Field Institute to conduct a telephone survey of a representative sample of residents. The surveyor contacted 1,003 respondents between September 7 and September 10, 2001; the survey was conducted in both English and Spanish. The sample set for the survey was developed using random digit dialing methods, which gave all adults in households with telephones an equal opportunity of being selected for the survey. This method enabled the survey to include households either with listed or unlisted telephone numbers in their proper proportions. Specifically, California residents 18 years and older were asked whether they stockpiled televisions and/or computer monitors that they were no longer using. After the completion of interviewing, appropriate statistical weights were developed to match the sample of California adults interviewed to known parameters of the total population in California. Estimates of sampling error from results based on the overall sample of 1,003 adults are plus or minus 3.2 percentage points at the 95 percent confidence level. Appendix D contains the survey questions and a summary of responses.

2000 Census Data Applied to Residents' Survey Results to Determine Statewide Volume of Stockpile

U.S. Census Bureau data from the 2000 census provided the total number of California households and that information was used to arrive at the volume of items stockpiled.[8] The number of households that were storing one, two, and three items, respectively, was derived by multiplying the total number of California households by the percentage of households that reported having a particular number of stored items. For those respondents that reported storing three or more televisions or monitors, it was assumed that precisely three items were being stored. The total number of stockpiled items was then calculated by multiplying the number of stored items per household by the number of households storing that particular number of items.

Findings

The purpose of this study was to identify the processors' current capacity to handle specified e-waste, project e-waste volume in 2006, and determine the cost to process the additional volume projected for 2006, if a gap existed. Additionally, it was to identify the degree to which Californians stockpile specified e-waste items and identify potential issues for the Board to consider.

This data in the following section of the report is presented at two levels:

1. As summary findings that tie together key data points generated from the consultant's research and surveys.
2. At a more detailed level in response to the five research questions developed by the e-waste steering committee.

Summary Findings

Future Volume of CRTs Exceeds Current Capacity to Process Them

The research findings show a gap exists between the current processing capacity and the projected volume of diverted CRTs for 2006. Alternatively, the current capacity to process CPUs exceeds the future volume of diverted CPUs. In its entirety, the capacity shortfall reflects a difference of thousands of tons of e-waste and millions of dollars in additional cost to process that waste.

Processors Predict a Smaller Increase in Processing Volume Than Historical Trends Would Predict

Processors are predicting a lower volume to be processed in 2006 than historical trends would indicate. Processors' self-reported projections represent the lower end of the projected volume range for every e-waste type and processing type except for secondary processing of televisions and secondary processing of CPUs. This lower volume projection may, in part, reflect a loss of some processors from the future processing market. Survey responses showed that 25 percent of primary processors and 14.3 percent of secondary processors included the elimination of handling these materials as a factor in their volume projections.

Some Processors Deterred From Handling CRT-Containing E-Waste

Verbal and written feedback from some processors indicates a desire to move away from processing CRT-containing televisions and computer monitors as a result of the costs associated with CRT handling requirements. According to these processors, profit margins to process televisions were slim before it was clarified that CRTs must be handled as a hazardous waste. With the understanding that dumping CRTs in landfills is not a disposal option, the additional costs to transport and handle CRT-containing e-waste makes them less attractive to processors.

Research Findings

As stated in the Introduction section, the steering committee identified five central questions that reflected the primary interest of the Board in this study:

1. In calendar year 2001, what is the capacity in California to process CRT-containing televisions and computer monitors, and CPUs, by processing type?

2. In calendar year 2006, what will be the projected range of CRT-containing and CPU e-waste volume in California, by e-waste type?

3. Can the current infrastructure (as determined in the answer to question 1) handle the volume of CRT-containing televisions and monitors and CPUs as projected for calendar year 2006, by e-waste type and processing type?

4. What is the projected range of cost to manage the additional volume of e-waste as projected for calendar year 2006, by e-waste type and processing type?

5. What is the current volume of the residential stockpile of CRT-containing televisions and monitors in California?

Following are detailed survey findings that address the five questions:

1. In calendar year 2001, what is the capacity in California to process CRT-containing televisions and computer monitors, and CPUs, by processing type?

Table 5 shows California's current e-waste processing capacity by e-waste type and processing type.

Table 5
Current Capacity to Process E-Waste (in tons)

	Primary Processing	Secondary Processing	Total Capacity
Televisions	4,000	900	4,900
Monitors	32,000	14,900	46,900
CPUs	34,200	62,100	96,300

- **Televisions**

  Based on sampling from the infrastructure survey findings, it is estimated that the current capacity of California's primary processors to handle televisions is approximately 4,000 tons, while the current capacity of secondary processors to handle televisions is 900 tons.

  Compared to the other e-waste types, processors appear to have the least capacity to handle televisions. Feedback from processors indicates that both supply and demand drive this marked difference. Some processors noted that they do not receive many televisions because their suppliers are businesses whose waste is predominantly computers. Additionally, it appears that it was not until the publication of the DTSC letter that landfill operators were aware, as a group, that they could not accept televisions; therefore, televisions may have been primarily deposited in landfills rather than diverted to processors in the past. According to processors, televisions, unlike computers, are more often used by their owners until they are no longer functional, and thus, their resale value is minimal. When the cost associated with the proper disposal of televisions as a hazardous waste is added to the equation, televisions may become even less attractive to processors.

- **Monitors**

  It is estimated that the current capacity of primary processors in California to handle monitors is 32,000 tons, and the capacity of secondary processors to handle monitors is 14,900 tons. Based on survey responses and follow-up phone calls with processors, the consultant found

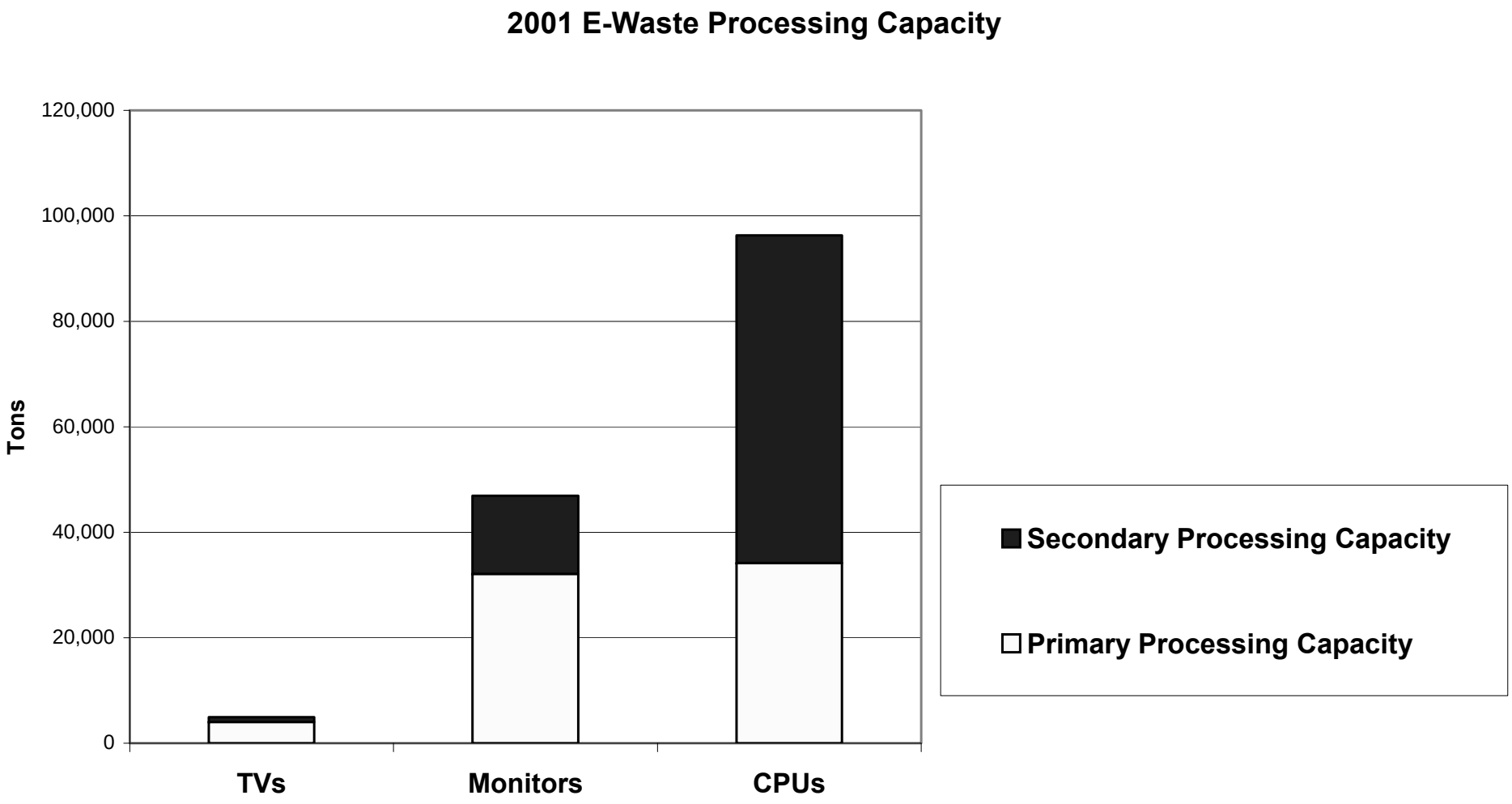
that many processors that handle monitors do not handle televisions. Processors indicated that owners generally replace their monitors at a faster rate than televisions, and therefore, monitors have greater resale value, either as an operating unit or for their component parts.

- **CPUs**

  It is estimated that the current capacity of primary processors in California to handle CPUs is approximately 34,200 tons. The current capacity of secondary processors in California to handle CPUs is 62,100 tons. Feedback from processors suggests that CPUs are the most lucrative type of e-waste, particularly at the secondary processing level because of the resale value of circuit boards. When asked in follow-up phone calls why processors have such a large capacity for CPUs, far beyond the current volume they process, processors stated that they would like to increase the CPU volume they process, if they could only identify a greater supply of them.

Figure A provides a graphical depiction of these findings.

Figure A


2001 E-Waste Processing Capacity
120,000
100,000
80,000
60,000
40,000
20,000
0
Tons
TVs
Monitors
CPUs
Secondary Processing Capacity
Primary Processing Capacity

2. In calendar year 2006, what will be the projected range of CRT-containing and CPU e-waste volume in California, by e-waste type?

Table 6 shows the projected volume of diverted e-waste in California by e-waste type and processing type.

Table 6
Volume Range of Diverted E-Waste Projected for 2006 (in tons)

	Primary Processing	Secondary Processing	Total Volume Diverted
Televisions	4,600–6,600	2,300 ♦	6,900–8,900
Monitors	25,400–46,300	15,500–22,200	40,900–68,500
CPUs	22,400–30,400	14,800–35,400	37,200–65,900

As noted in the methodology section of the report, the consultant used two models to forecast the 2006 volume of e-waste: a historical average forecast and a self-reported forecast.

For most processing types and e-waste types, processors' self-reported projections for volume processed in 2006 represent the lower range of projected volume while the upper end of the volume ranges reflects the projections built by applying historical trends to the future. By comparing the two ends of the ranges, it is clear that processors expect the future volume of e-waste processed to be lower than what the past would indicate.

There are two exceptions to this outcome. First, for CPUs diverted to secondary processors, the processors' self-reported projections for 2006 volume reflect the higher end of the estimated range. In other words, secondary processors expect to handle more CPUs in 2006 than historical trends would predict. Second, as explained in the Methodology section of the report, the estimate for the future volume of televisions for secondary processing does not fit this model because it was built using only the self-reported forecasting model and therefore is not shown as a range.

It is important to note that some processors made it clear, both in surveys and in telephone interviews, that after becoming aware that CRTs must be handled as hazardous wastes, they would have to reexamine whether processing this type of e-waste was economically viable. This was particularly true amongst primary processors. However, the fact still remains that CRTs cannot be deposited in landfills and therefore the volume of CRTs that needs to be diverted for processing will increase.

While one larger processor indicated that its growth in processing volume of televisions and computer monitors was uninterrupted by any clarification of the State regulations, others have reported a decline in the volume they were willing to process due to the costs associated with handling CRTs as a hazardous waste. According to these processors, State regulations add an additional cost to processing these items. In the case of televisions, some processors reported that the profit margin on televisions was already low and the addition of any new cost would reduce or eliminate their already slim profit margin. As a result, these processors want to reduce, not increase, their role in processing CRT-containing televisions.

♦ See footnote on page 7 for an explanation of why this value is not presented as a range.

- **Televisions**

  The estimated volume of televisions that will be diverted to primary processors in 2006 ranges from 4,600 tons to 6,600 tons. The estimated volume of televisions that will be diverted to secondary processors is approximately 2,300 tons. Compared to monitors and CPUs in both types of processing, the volume range of televisions is notably smaller. The lower end of the range may be explained, in part, by processors' unwillingness to handle televisions. In other words, the current low capacity limits the volume of televisions that can be processed. Even the high end of the range, which is based on historical figures, indicates that people may wish to divert their televisions but few processors will likely accept them.

- **Monitors**

  The volume of monitors that is projected to be diverted to primary processors in California in 2006 is estimated to range from 25,400 tons to 46,300 tons, while the volume of monitors that is projected to be diverted to secondary processors in 2006 ranges from 15,500 tons to 22,200 tons.

- **CPUs**

  The volume of CPUs that will be diverted to primary processors in California in 2006 is estimated to range from 22,400 tons to 30,400 tons. For secondary processing, it is estimated that the volume of CPUs diverted will range from 14,800 tons to 35,400 tons.

Figures B and C provide graphical depictions of these findings.

Figure B

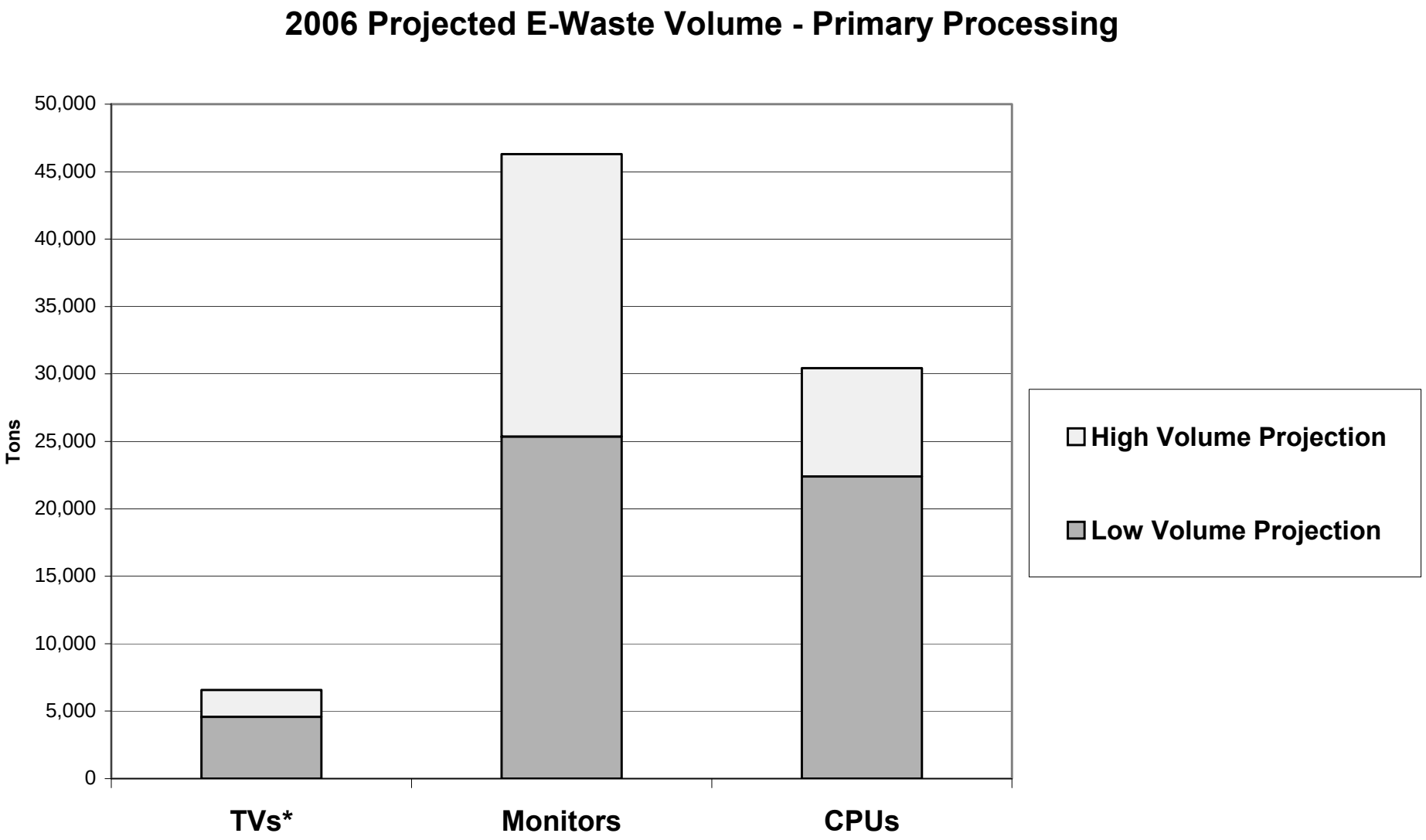
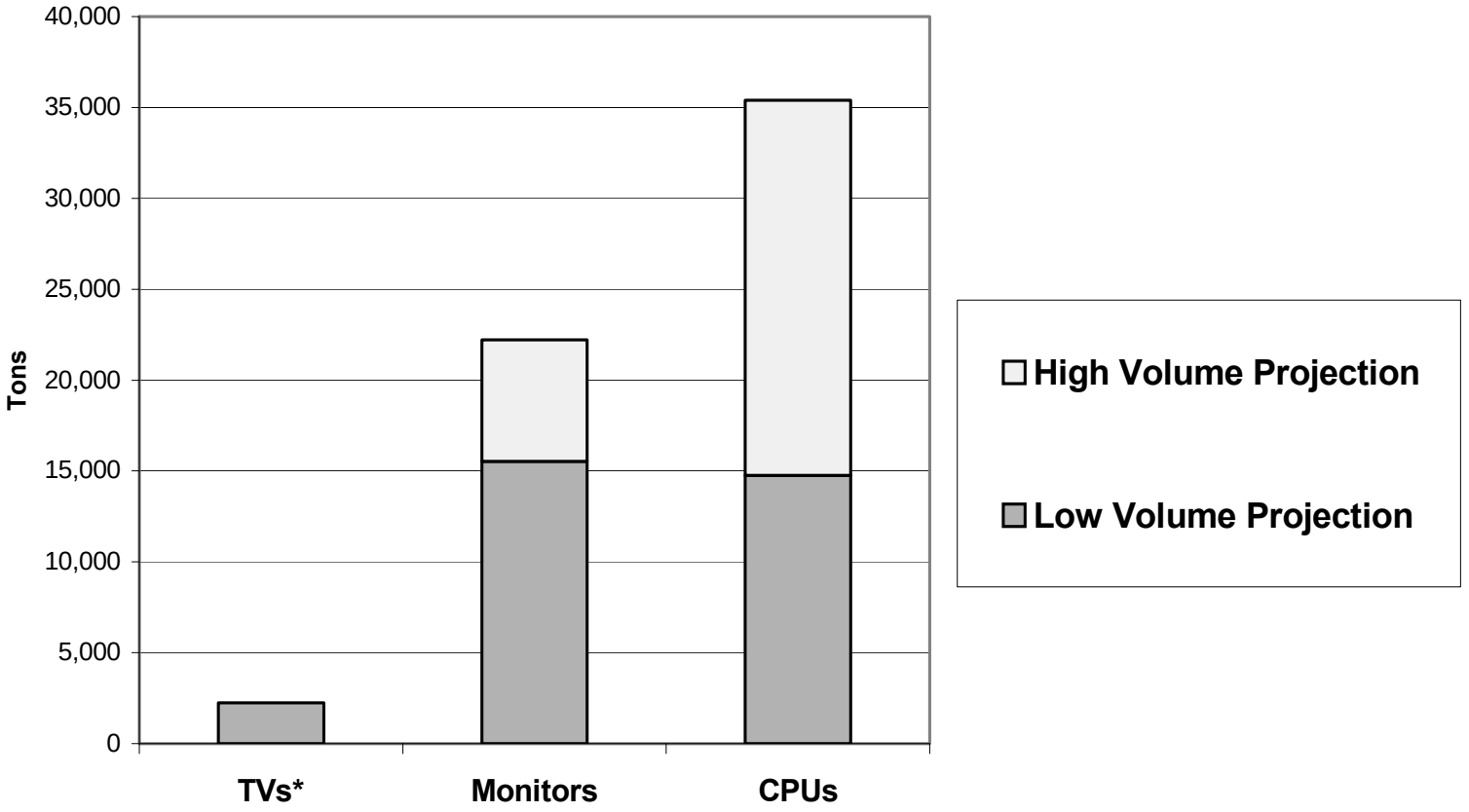

2006 Projected E-Waste Volume - Primary Processing
Tons
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
TVs*
Monitors
CPUs
High Volume Projection
Low Volume Projection

Figure C

2006 Projected Diverted E-Waste Volume - Secondary Processing



* See footnote on page 7 for explanation of why this value is not presented as a range.

3. Can the current infrastructure (as determined in the answer to question 1) handle the volume of CRT-containing televisions and monitors and CPUs as projected for calendar year 2006, by e-waste type and processing type?

Table 7 shows the estimated gap between California's current e-waste processing capacity and 2006 diverted e-waste volume.

Table 7
Gap Between Current Processing Capacity and 2006 Diverted E-Waste Volume (in tons)

	Primary Processing	Secondary Processing	Total Gap
Televisions	600 – 2,600	1,400♦	2,000 – 4,000
Monitors	0 – 14,300	600 – 7,300	600 – 21,600
CPUs	No gap	No gap	No gap

- **Televisions**

  The estimated shortfall of primary processors' current capacity to handle the future supply of diverted televisions ranges from approximately 600 tons to 2,600 tons. For secondary processors, the future volume of televisions exceeds current capacity by approximately 1,400 tons. The findings were corroborated through anecdotal evidence provided by processors during follow-up interviews and discussions. As discussed in research findings 1 and 2, televisions have a very low market value and therefore processors are unwilling to accept the volume. Consequently, as the volume of televisions increases, the gap becomes more severe.

- **Monitors**

  For primary processing, it is estimated that the future volume of monitors being diverted ranges from a value that falls within the current capacity of primary processors to that which exceeds the current capacity by 14,300 tons. This reflects the difference between the self-reported forecast for monitor volume, which does not exceed current capacity, and the historical average forecast, which projects a gap of up to 14,300 tons. For secondary processing, both forecasting models predict a gap between future volume and current capacity—a gap that could range between 600 tons and 7,300 tons.

- **CPUs**

  No gap is projected between current processing capacity and 2006 volume for CPUs, in either primary processing or secondary processing, because capacity exceeds projected volume. Within primary processing, the projected volume ranges from 22,400 tons to 30,400 tons, which is less than the estimated current capacity of 34,200 tons. Similarly for secondary processing, the projected volume range of 14,800 tons to 35,400 tons is less than the estimated current capacity of 62,100 tons. These quantitative findings were supported through personal interviews and anecdotal evidence encountered during the survey process. During that personal contact, processors repeatedly noted that CPUs are the most desired of the e-waste types included in this study. As a result, processors have built significant capacity and are searching for additional sources for used CPUs. In fact, some processors indicated

♦ See footnote on page 7 for an explanation of why this value is not presented as a range.

that CPUs are sometimes used to subsidize less profitable monitors. For example, a processor might agree to take a user's monitor for free, providing the CPU is included.

Figures D and E provide graphical depictions of these findings.

Figure D

Gap Analysis - Primary Processing
2006 Projected Diverted E-Waste Volume Compared to 2001 E-Waste Processing Capacity

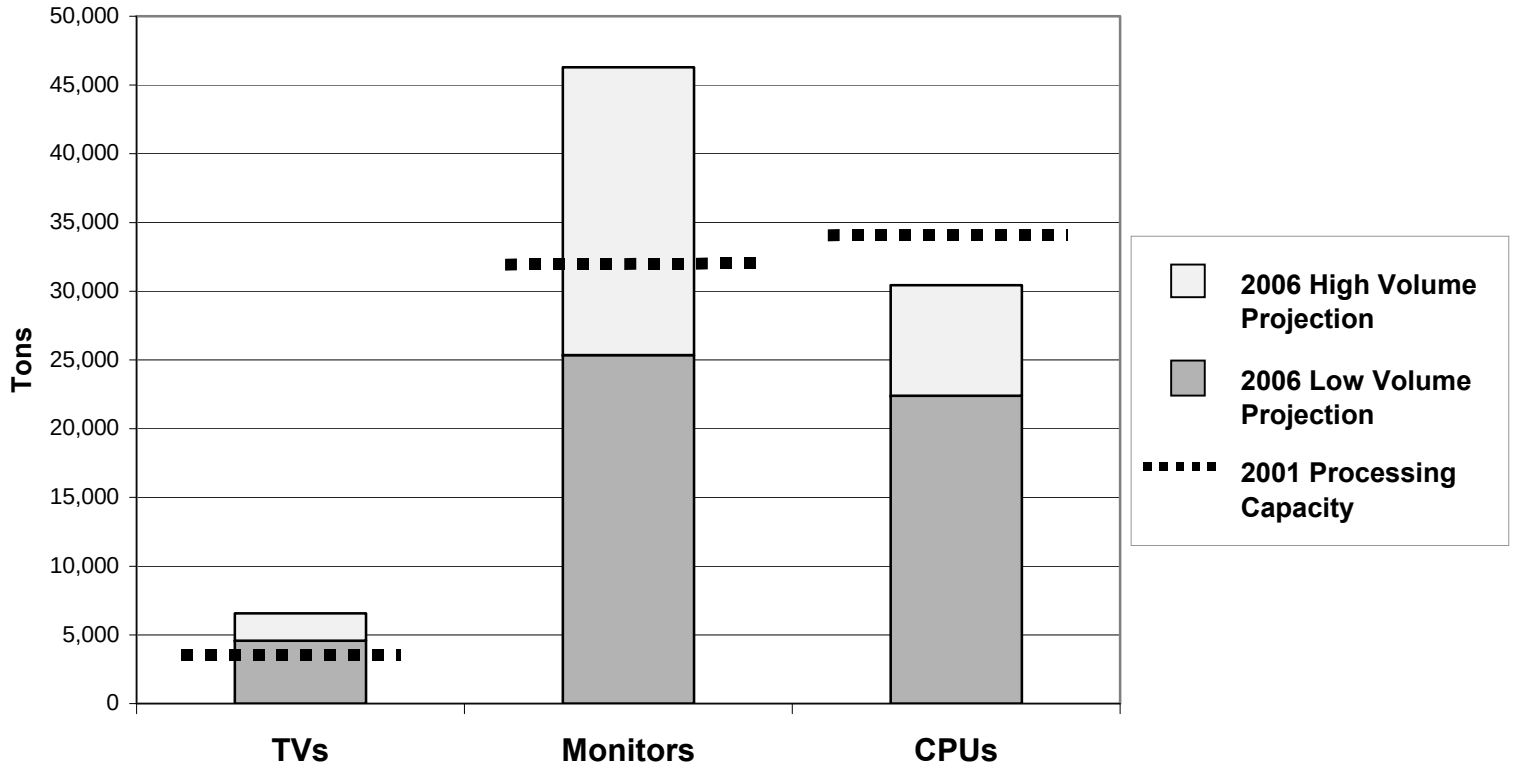
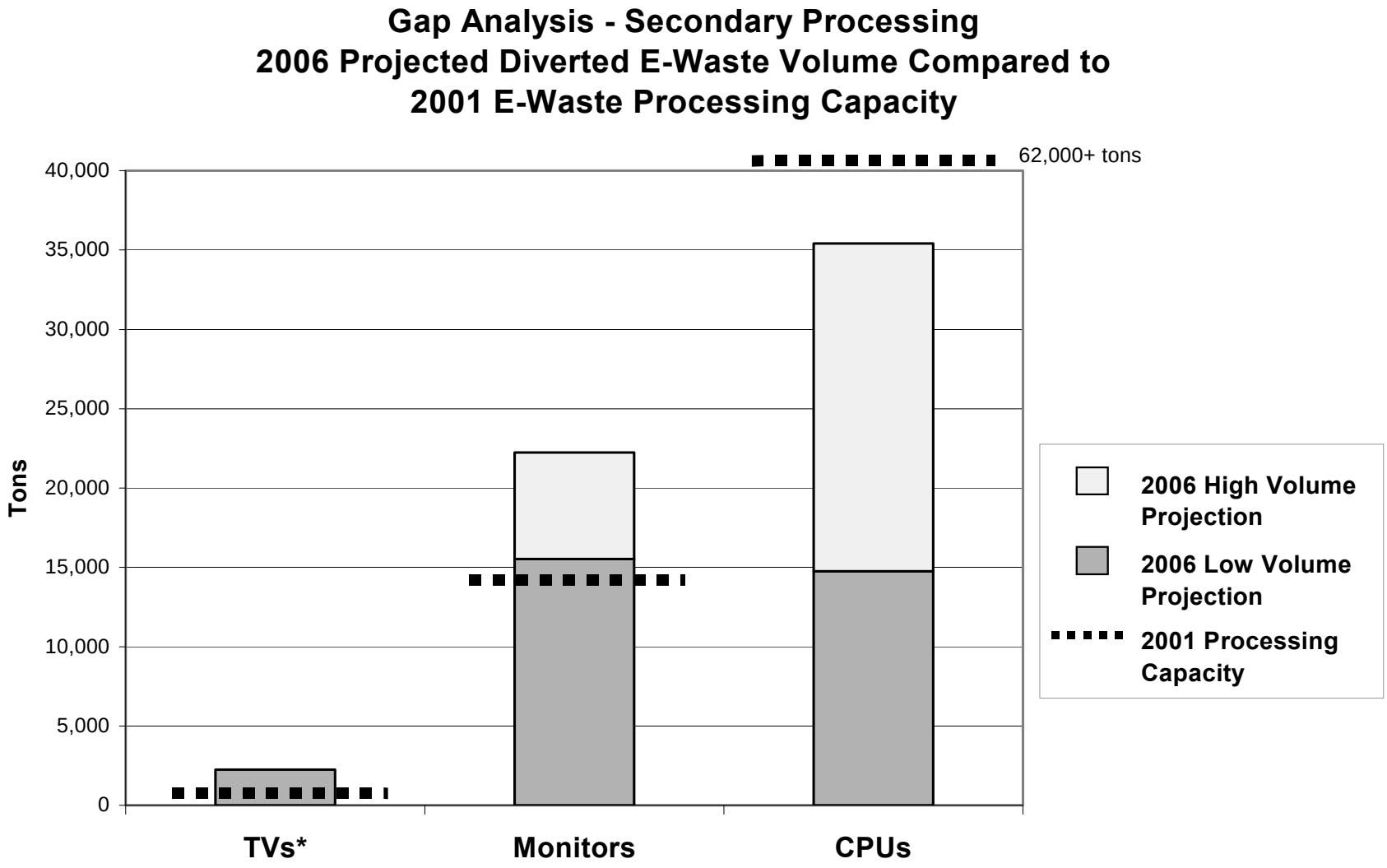


Figure E



* See footnote on page 7 for explanation of why this value is not presented as a range.

4. What is the projected range of cost to manage the additional volume of CRT-containing and CPU e-waste as projected for calendar year 2006, by e-waste type and processing type?

Table 8 below shows the estimated projected range of costs to handle the 2006 volume of diverted e-waste.

Table 8
Projected Range of Cost to Handle Additional Volume of Diverted E-Waste in 2006 (in millions and in 2006 dollars)

	Primary Processing	Secondary Processing	Total Cost to Handle Additional Volume
Televisions	$1.6–$6.8	$2.4♦	$4.0–$9.2
Monitors	$0–$25.7	$.7–$8.0	$.7–$33.7
CPUs	No cost	No cost	No cost

- **Televisions**

  Within primary processing, the average processing cost per ton is estimated to be approximately $2,600. Applying this per-ton cost to the gap between current capacity and future volume results in a total cost range of $1.6 million to $6.8 million to process the additional volume of e-waste. For secondary processing, the total cost of the gap is approximately $2.4 million, or approximately $1,700 per ton.

- **Monitors**

  Because the future volume estimated for monitors undergoing primary processing ranges from no gap to a gap of 14,200 tons, the cost estimate runs from $0 to $25.7 million at a cost-per-ton of approximately $1,800. For secondary processing of monitors, the cost to process the additional e-waste volume ranges from $700,000 to $8.0 million at approximately $1,100 per ton.

- **CPUs**

  The estimated future volume in both primary and secondary processing does not exceed the estimated current capacity to process CPUs. Therefore, there is no gap or cost associated with a gap. On the contrary, there is an appreciable excess of capacity to process CPUs. For CPUs, the average cost to process a CPU ranges from approximately $700 per ton for secondary processing to about $1,500 per ton for primary processing.

The focus of this research question is to identify the cost associated with processing the 2006 volume that exceeds 2001 processing capacity. However, should the Board consider offering financial incentives to processors, these incentives may need to be applied to the full volume of processed e-waste, not just the volume that exceeds current capacity. As such, the total cost of processing the entire 2006 projected volume (not just the gap) is provided in Appendix E. These costs were calculated by applying the average per-ton processing cost to each of the 2006 volume forecasts.

♦ See footnote on page 7 for an explanation of why this value is not presented as a range.

5. What is the current volume of the residential stockpile of CRT-containing televisions and monitors in California?

Table 9 shows the extent of California's stockpile of televisions and monitors.

Table 9
CRTs Stockpiled in California Households

	Tonnage	Number	Percent of Households
Televisions	73,600 tons	2.9 million	18.5 percent
Monitors	47,800 tons	3.2 million	19.4 percent

- **Televisions**

  According to a representative phone survey that was conducted by The Field Institute in September 2001, 18.5 percent of California households stockpile televisions: 13 percent stated that they were storing one television; 3.9 percent were storing two televisions; and 1.6 percent were storing three or more televisions. Consequently, there are approximately 2.9 million televisions, or almost 74,000 tons of televisions, stockpiled in California households. It is interesting to note that this volume is between 8 and 10 times the total volume of televisions projected to be processed in 2006.

- **Monitors**

  According to The Field Institute survey, 19.4 percent of California households stockpile computer monitors: 13.9 percent stated that they were stockpiling one monitor; 2.7 percent were stockpiling two monitors; and 2.8 percent were stockpiling three or more monitors. Accordingly, there are approximately 3.2 million monitors, or almost 48,000 tons of monitors, stockpiled in California households. If released all at once, this stockpile volume could more than double the entire projected volume of diverted monitors in 2006.

Conclusions

According to the study's findings, a gap exists between the current processing capacity and the projected volume of diverted CRTs, but not of diverted CPUs. The CPU phenomenon appears clear: processors possess a large current capacity to handle CPUs because of their profitability. Therefore, current capacity can accommodate future volume.

As for CRTs, the story is more complicated. Survey findings show that processors expect to process less e-waste in 2006 than historical trends would predict. The survey also showed that some processors project lower volumes in the future because they are reducing or eliminating CRT-containing televisions and computer monitors from those e-waste items they process. Finally, verbal and written feedback from some processors indicated that this potential exit from the processing market is due to the cost of handling CRTs appropriately, a cost that is perceived as new, since the clarification of existing regulations in March of 2001. While all of these factors indicate a reduction in the number of processors, it is not clear how this decrease will impact actual processing capacity in California.

Impact of Loss of Processors Is Uncertain

Taken to an extreme, a loss of primary and secondary processors from the market would mean that residents and businesses would have nowhere to properly dispose of their waste, and stockpiling and illegal disposal might increase. Although it is known what percentage of respondents are considering leaving the market—25 percent of primary processors and 14.3 percent of secondary processors—it is not certain what the magnitude of this loss will mean in terms of total processing capacity. For example, the remaining processors could potentially increase capacity sufficiently to replace that of departing processors.

Large Secondary Processors May Be Linchpin to Capacity

Large secondary processors accept large quantities of used televisions and computers directly from businesses and government clients, as well as from primary processors—such as thrift stores—who must dispose of televisions and computers that could not be repaired or resold. Large processors, then, serve as the final stop along the processing continuum and could cause a bottleneck for processing if their capacity does not expand to absorb increased volume of diverted e-waste.

Of the 14.3 percent of secondary processor respondents who indicated a desire to exit the market, none were large processors. If, in fact, large secondary processors are not hampered by the cost of appropriate disposal of CRTs, then this link in the processing market should not be in danger of contracting as the volume of diverted e-waste increases. However, whether or not the current capacity of these large processors will increase fast enough to meet the supply of diverted e-waste in 2006 is unknown.

Loss of Smaller Processors May Mean Loss of Convenient Access to Diversion

Large processors may be able to absorb the capacity lost to smaller processors exiting the market. However, opportunities to divert e-waste may be limited by the loss of local diversion outlets such as thrift stores.

Thrift store operators were the most consistent in reporting that the cost of discarding donated televisions and monitors that could not be sold was proving prohibitive. As a result, these stores were either considering instituting a policy, or had already instituted one, to refuse CRT donations. In this case, the loss of a local thrift store could mean that residents lose a convenient

outlet for recycling their televisions and computers. According to The Field Institute survey results, the trend to give away used items for reuse was strong.♦ Other recyclers have reacted to the increased costs by imposing significant CRT disposal fees. Some of these processors have reported clients walking away from their facilities when learning of new disposal fees for used televisions and monitors. It is unknown what these people did with the items they were going to recycle. The cumulative effect of no landfill disposal, fewer collection opportunities, and introduction of processing fees may deter household diversion.

Introducing New Outlets for Diversion May Mitigate Loss of Local Processors

Local collection programs, whether administered by government or private business, may be able to compensate for some of the loss in local diversion capacity. If local programs were available, residents could place their e-waste items at the curb or take them to local drop-off sites instead of donating them to thrift stores. The success of shifting e-waste diversion capacity to local collection programs would depend upon making these programs cost-effective and convenient and then educating the public about the "new" diversion opportunities.

However, these programs would be constrained by the same cost considerations as thrift stores. At this time, it is unlikely that either public or private local collection programs would consider expanding their efforts into the e-waste diversion market because of high handling and transportation costs.

Board May Wish to Monitor Processing Market

The Board is faced with a market that is undergoing change. Processors predict a slowdown in the growth of e-waste that will be processed in 2006; they perceive "new" costs associated with CRT disposal; and some even indicate a desire to exit from the market. Some of these effects may be mitigated once processors learn about the implications of the emergency regulations on their bottom line. It would benefit the Board's policy decisions to continue to monitor how the market is shifting and what factors are causing these shifts. This information will help the Board to know, for example, if and where more collection opportunities need to be implemented, or whether the capacity of secondary processors needs to be shored up before residents are informed of new disposal opportunities or encouraged to deplete their stockpiles.

♦ Over 43 percent of non-stockpilers gave their used televisions to a friend, relative, or to charity, and almost 30 percent did the same with their monitors.

Considerations

The conclusions drawn reflect the period of study for this report—that is, through calendar year 2006. The Board should be aware of factors that may have an impact on the e-waste stream—affecting both the supply of e-waste (volume) and the demand for e-waste (capacity)—beyond the years of this study. Additionally, the projections in the Findings section do not reflect the impact of certain actions the Board and other government agencies may take within the next five years, such as encouraging a release of stockpiled items, or changing regulations that may impact the market. The Board needs to be cognizant how these actions and related issues can impact California's ability to successfully divert e-waste. This chapter explores some of those issues.

Factors Influencing E-Waste Volume

Sales Volume Continues to Be Large

Currently, CRTs and CPUs are sold in the U.S. and California in great numbers. These numbers will continue to grow in the next five years. Although the length of time between purchase and disposal is difficult to predict, it is certain that increasing sales through 2006 will yield continued high volumes of e-waste in the coming decades. Table 10 below presents the projected sales volume for CRT televisions, CRT monitors, and CPUs through 2006.

Table 10
California Sales Data ♦ (units shipped in millions)

	2001	2002	2003	2004	2005	2006
Televisions	3.33	3.29	3.35	3.40	3.46	3.52
Monitors	5.36	5.45	5.56	5.51	5.44	5.37
CPUs	6.79	7.07	7.25	7.43	7.59	7.82

Sales and product data is insufficient to predict when a product will become e-waste and therefore cannot be used to predict diverted volume.

While it is worthwhile to examine sales trends in order to have a general understanding of the magnitude of electronic products that will ultimately become e-waste, it is important not to be misled into assuming that one can accurately predict *when* a particular item sold today will become e-waste. As part of the Scope of Work, the consultant was directed to survey electronic manufacturing firms for historical and projected sales data of specified electronic products. The original purpose of the task was to use sales figures to estimate the future volume of e-waste. To

♦ The NSC's national sales estimates and projections were used for televisions and CPUs, and an average annual percentage growth rate was applied to the projections NSC had made through 2003 and 2005.[8] National sales projections from Gartner Research—a nationally recognized research firm that specializes in technology—were used for monitors.[9] Since Gartner Research's projections extended to 2005, the rate change from 2004 to 2005 was assumed from 2005 to 2006. In order to extrapolate California sales from national estimates, California's population as a percentage of national population was applied to the projections for televisions. California sales were estimated to be 12.04 percent of national sales using this calculation.[10] For monitors and CPU sales, computer ownership in California households as a percent of computer ownership nationally was used. Based on this methodology, California monitor and CPU sales were estimated as 13.60 percent of national sales.[11]

prepare for this survey, the consultant conferred with three sources about the reliability of using sales data to create a sales-to-disposal model.

The three sources were: a large computer manufacturing firm that recycles monitors; Gartner Research, a nationally recognized research firm that specializes in technology; and a professor within the Department of Civil and Environmental Engineering at San Jose State University who is currently researching e-waste diversion. All three experts indicated that the sales-to-disposal relationship is problematic. According to Gartner Research, the variables that play into disposal behavior are so numerous and disconnected that predicting disposal at a future point in time based on sales data is erroneous. Gartner Research itself is no longer producing these sales-to-disposal reports. The Board should not try to associate sales data to disposal volume to identify needed capacity at a point in time, as no direct link can be made.

Technology Trends Will Not Alter CRT-Containing E-Waste Volume in Near Term

Table 10 shows CRT monitor sales beginning to decrease in 2004. According to Gartner Research, the decline is due to increasing sales of flat-panel display (FPD) monitors in the sales market displacing CRT-containing monitors. Despite this dip in sales, Gartner Research predicts that the sales volume of CRTs will remain high, even as non-CRT technologies, specifically FPD monitors, rise to meet it.♦[12] Therefore, within the time window of this study—2001 through 2006—non-CRT monitor technology is not predicted to cause CRT sales to fall below 2001 levels.

In the coming decade, it is conceivable that CRT monitor sales will decrease below current levels, as a result of the mainstreaming of FPD monitors or some other non-CRT technology. After some undeterminable time lag, there will be an impact on the volume of e-waste that contains CRTs. However, with the high volume of CRTs sold each year and the myriad lifecycles that products can have based on individual variables, it is likely that CRTs will remain in the e-waste stream, at significant numbers, for years to come. As a case in point, almost half of the televisions collected during a pilot collection project conducted in Minnesota in 1999 and 2000 were manufactured in the 1960s and 1970s—discarded two and three decades after they were sold.[13] Thus, the Board should understand that FPD monitor sales might not affect the waste stream for quite some time.

The impact of digital television (DTV) and its subset, high definition television (HDTV), were not quantified for this report, as any significant effect will likely occur outside the timeframe of this study. However, there are several important factors the Board should consider when considering DTV's influence on the e-waste stream.

- The Federal Communications Commission (FCC)-mandated transition period is currently scheduled to end no earlier than December 31, 2006. Until that time, broadcasters will continue to operate their old analog stations. [14]
- The FCC asserts that consumers will be able to purchase a relatively inexpensive converter to allow their existing televisions to receive DTV programming. Therefore, householders will not be required to replace their existing televisions to accommodate DTV. [15]
- As noted in the section on sales trends, there is not necessarily an immediate relationship between sales and disposal. In other words, a newly purchased HDTV will not necessarily precipitate the disposal of a CRT-containing television into the e-waste stream.

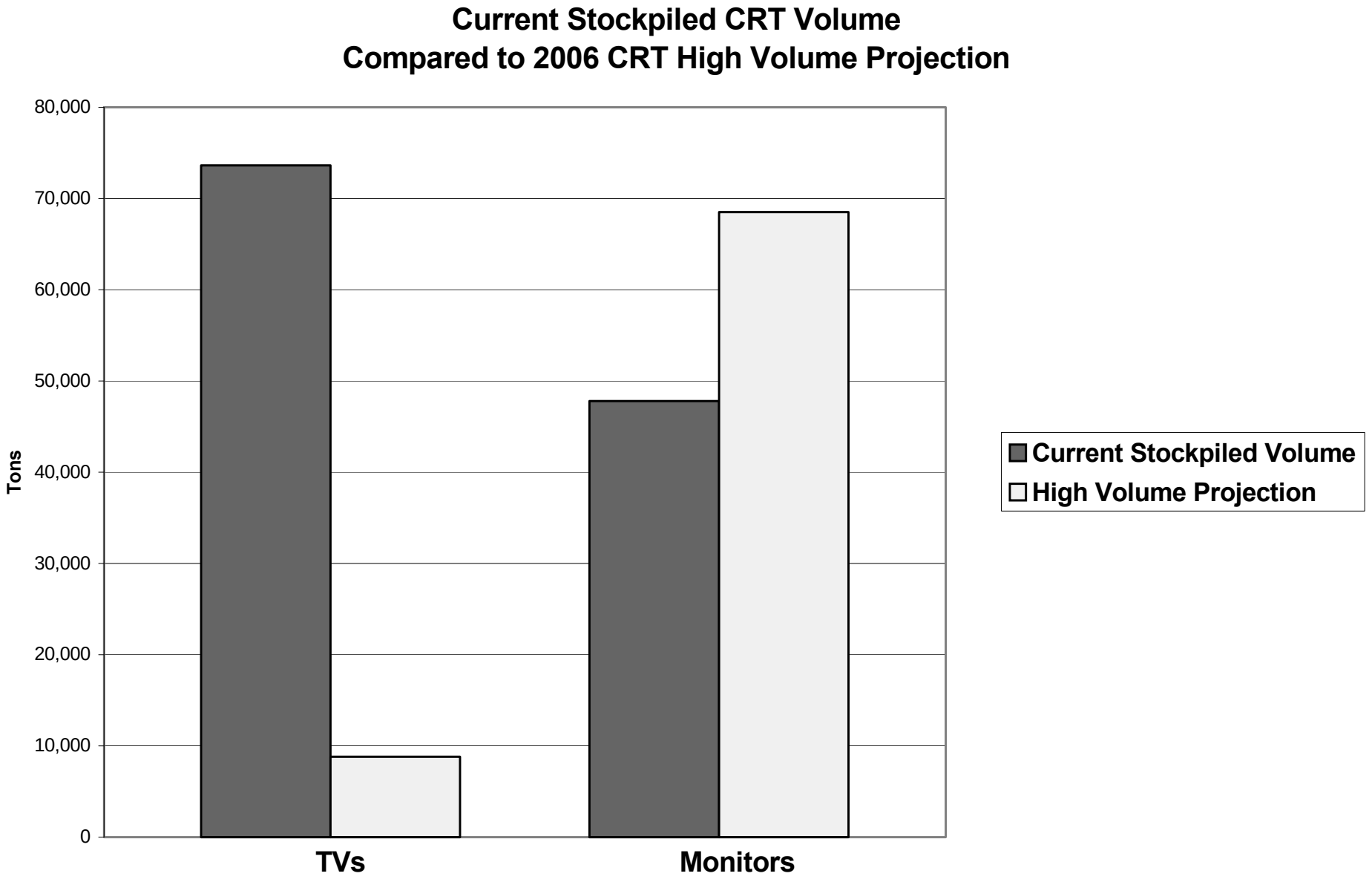
♦ Manufacturers have also recently introduced "flat screen" televisions. However, these flat screen items still contain CRTs and prompt no change in the CRT e-waste stream.

Shifts in Householders' Behaviors Can Affect Volume of E-Waste Being Diverted

Residents' individual stockpiles of electronic products are depleted and replenished over time. The e-waste stream accounts for these irregular contributions from stockpiles, as well as direct disposal behavior. However, as stockpiles exist, they do represent a significant supply of e-waste that, if depleted all at once or in significant quantities, would represent a glut of e-waste. This event would be brought on only by a shift in disposal behavior: stockpilers, as a group, would have to feel compelled to drain their stockpiles.

Figure F compares the current CRT stockpiled volume to the maximum diverted e-waste projected for 2006.

Figure F


Current Stockpiled CRT Volume
Compared to 2006 CRT High Volume Projection
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Tons
TVs
Monitors
Current Stockpiled Volume
High Volume Projection

In order to provide the Board with some context regarding stockpiling behavior and what residents would respond to in order to deplete the stockpile, householders were asked to identify how likely they would be to move their stockpile under several different scenarios. Householders responded favorably to the options presented randomly to them. As can be seen below, 73 percent of respondents are very likely or somewhat likely to take items to a local drop-off center. Just over 82 percent are very likely or somewhat likely to take their television or monitor to a site to have it refurbished for donation. And almost 71 percent would be very likely or somewhat likely to remove their television or monitor from the stockpile if there were a curbside program available. The results are summarized in Table 11.

Table 11
Field Institute Survey Results Regarding Stockpiling Behavior

Would knowing this make you very likely, somewhat likely, or not likely to move a stored television or computer out of storage?				
	Percent of Responses			
	Very Likely	**Somewhat Likely**	**Not Likely**	**Don't Know**
Learning that there is a drop-off center in your area where you can go to dispose of a stored television or computer monitor.	46.5%	26.5%	23.3%	3.7%
Learning that there is a place in your area where you can take a stored television or computer monitor to have it refurbished for donation.	56.6%	26.0%	13.2%	4.2%
Learning that you can dispose of a stored television or computer monitor by placing it at curbside for pick-up by a local recycling agency.	50.7%	20.2%	26.0%	3.2%
*Columns total to more than 100 percent, as respondents were asked to respond to each scenario.				

With approximately 121,400 tons of stockpiled items and some processors indicating that they may discontinue processing televisions and monitors, the implications of the Board taking action to encourage release of the stockpile are significant.

Factors Affecting Processing Capacity

In the survey, transportation costs were cited most often as a limiting factor with respect to the processing capacity for televisions and monitors. Additionally, a widespread understanding that CRT-containing waste cannot be disposed of as a solid waste is both increasing the number of televisions and monitors diverted from landfills and negatively affecting processors' willingness to accept and process this e-waste. Any future governmental action taken could have intended and possibly unintended consequences on the e-waste stream and those entities through which the e-waste stream flows. Understanding potential regulatory impacts and other market dynamics, such as transportation costs, will allow informed policy decisions now and in the future. Market dynamics or changes in policies or regulations could result in processors entering or exiting the market, thus either increasing or decreasing infrastructure capacity.

New Federal Prison May Accept E-Waste, Thereby Increasing Capacity

According to CIWMB staff, a processing facility at the United States Penitentiary at Atwater will be functioning in the near future.♦ Because it is generally understood that the Atwater facility will have a large processing operation, the Board may wish to better understand the magnitude and constraints of this facility's capacity.

More Processors May Be Identified Through Reporting Requirements, Thereby Refining Capacity Numbers

At this time, it appears that the list created by the consultant is the most recent and comprehensive list of processors in the state. However, a more robust list may be developed as a result of emergency regulations currently in effect. Beginning November 1, 2001, any CRT material handler that annually accepts five CRTs or more must provide specified information to DTSC and the local certified unified program agency (CUPA) each year, including its business name and mailing address, a contact name, and the physical location of the CRT material management activities.[16] In subsequent years, CRT processors will be required to report quantities of CRTs processed. By instituting reporting requirements, the DTSC may find that it is able to locate additional processors that were not identified in this study, or that may enter the market in the future.

Issues Outside the Scope of This Report

Throughout the study, a number of interesting questions arose that were not within the purview of this study, and therefore were left unanswered. However, they are issues the Board may still need to consider for policy decisions that have long-term implications. The questions, listed below, are divided into two groups, depending on whether they impact future e-waste volume or processors' capacity:

Volume

- How can the Board work with industry to reduce the number or toxicity of CRTs being manufactured?
- Should the Board take action to encourage the release of stockpiled items? If so, when should this happen and in what form?
- What does the Board need to know about other e-waste types such as cash registers, videocassette recorders, cell phones, copiers and printers, stereos and speakers, microwaves, x-ray machines, scientific equipment, DVDs, and other electronic devices?
- Should the Board begin developing a survey methodology now to begin collecting data on the number of e-waste items being diverted to primary and secondary processors before processors are required to begin reporting that information in November 2002?
- To what extent will landfill operators find televisions and monitors and divert them to processors?
- What specific actions (for example, education campaign or development of collection programs) should the Board take to increase the volume of e-waste being diverted?

♦ The consultant sought to have representatives from the facility complete an infrastructure survey or be interviewed by telephone. However, despite repeated attempts, neither effort proved successful. As a result, the capacity of the facility is unknown.

- What is the projected e-waste stream in five years, based on various intervention scenarios (for example, education campaign or the development of curbside collection programs)?
- What volume of e-waste is currently collected from curbside recycling programs, one-day drop-offs, amnesty programs, etc.?

Capacity

- What information should the Board ask processors to begin collecting immediately to enable the Board to make more informed decisions?
- To what degree should the Board assist processors so that they develop additional capacity for CRT-containing televisions and computer monitors?
- To what extent do government regulations negatively impact processors' ability to operate?
- How are large and small, primary and secondary, processors affected differently by the cost of handling CRTs?
- Will processors need something other than money to handle the projected increase in e-waste?
- What are some constraints for the other entities in the e-waste handling stream (for example haulers, exporters, and landfill operators) to manage the expected increase in volume?
- What capacity do the processors need to have in the year 2010?

Appendix A

Processor Survey

Following is the survey sent to primary and secondary processors.

Purpose of this Survey

This survey is being conducted for the purpose of better understanding the volume of TVs and computers (monitors and central processing units [CPUs]) that primary and secondary processors handle in California.

Findings from this survey will be presented in an ANONYMOUS and aggregated manner.

Who Should Complete this Survey

Please complete this survey only if you are a business *in California* that conducts one or both of the following types of processing:

- Primary processing = refurbishing or repairing of TVs, computer monitors, and/or CPUs for resale.
- Secondary processing = demanufacturing of TVs, computer monitors, and/or CPUs in order to recover raw materials.

How to Complete this Survey

You may choose to complete the survey via the Internet at
www.mgtamer.com/Surveys

All Respondents enter Survey Number 1884

You may also complete this paper copy of the survey and return it:

- Via Fax: (916) 319-7299, to the attention of Mitch Delmage
- Via Mail:

  California Integrated Waste Management Board
  Special Waste Division, Executive Unit
  Attention Mitch Delmage
  1001 I Street
  P.O. Box 4025
  Sacramento, CA 95812

For survey assistance, please call MGT of America toll-free at 1-877-617-5693.

Please return this survey by Friday, September 21st.

Please answer the following three questions before completing the appropriate section of the survey.

1. How would you categorize your business?

a. Product refurbish and resale
b. Non-profit redistributor
c. Raw materials recycler
d. Refurbisher and raw materials recycler
e. Thrift Store

2. In what county is your business physically located?

Alameda	Fresno	Los Angeles	Nevada	San Joaquin	Sonoma
Alpine	Glenn	Madera	Orange	San Luis Obispo	Stanislaus
Amador	Humboldt	Marin	Placer	San Mateo	Sutter
Butte	Imperial	Mariposa	Plumas	Santa Barbara	Tehama
Calaveras	Inyo	Mendocino	Riverside	Santa Clara	Trinity
Colusa	Kern	Merced	Sacramento	Santa Cruz	Tulare
Contra Costa	Kings	Modoc	San Benito	Shasta	Tuolumne
Del Norte	Lake	Mono	San Bernardino	Sierra	Ventura
El Dorado	Lassen	Monterey	San Diego	Siskiyou	Yolo
		Napa	San Francisco	Solano	Yuba

3. Please indicate the processing method(s) and item(s) processed at your facility:

	Primary Processing	**Secondary Processing**
TVs		
Computer monitors		
Computer CPUs		

Sample answer	**Primary Processing**	**Secondary Processing**
TVs	✓	✓
Computer monitors		
Computer CPUs	✓	

- **Primary processing** = refurbishing or repairing of TVs, computer monitors, and/or CPUs for resale.
- **Secondary processing** = demanufacturing of TVs, computer monitors, and/or CPUs in order to recover raw materials.

How to Continue this Survey

- If you are only a **primary processor**, please continue to page 3. *[page 35 of this document]*
- If you are only a **secondary processor**, please skip to page 7. *[page 39 of this document]*
- If you are **both a primary and secondary processor**, please complete both sections of the survey beginning on page 3. *[page 35 of this document]*

Primary Processing Section

1. What is your maximum capacity to process each of the following items in calendar year 2001? (Please circle the units that correspond to your answer)

Sample answer:	100,000	pounds	(tons)	TVs
a. Televisions		pounds	tons	TVs
b. Computer monitors		pounds	tons	computer monitors
c. TVs and monitors combined (if not tallied separately)		pounds	tons	TVs and computer monitors
d. Computer CPUs		pounds	tons	computer CPUs

2. What is the average total processing cost per unit to process the following? (Please circle the units that correspond to your answer)

Sample answer:	$ 30	(per pound)	per ton	per TV
a. Televisions	$	per pound	per ton	per TV
b. Computer monitors	$	per pound	per ton	per computer monitor
c. Computer CPUs	$	per pound	per ton	per computer CPU

3. Which of the following processing costs do you predict will increase by 10 percent or more by 2006, not including the effects of general inflation? (Circle all that apply)

a. Labor costs
b. Storage costs
c. Transportation costs
d. Technology cost

For Questions 4-6 please use the sample format below

Sample Answer

Product Type	1996	1997	1998	1999	2000
TVs	Don't know	37,500	42,000	47,890	55,900
Computer monitors	Don't know	55,000	57,800	63,450	63,450
CPUs	0	0	0	0	0
☞ Circle type of unit:	pounds	(tons)	number (quantity) of items		

4. How much of the following items did you process in each of the years 1996-2000?

Product Type	1996	1997	1998	1999	2000
TVs					
Computer monitors					
Computer CPUs					
☞ Circle type of unit:	pounds tons	number (quantity) of items			

5. How much of the following items have you processed each month since the start of 2001?

Product Type	January 2001	February 2001	March 2001	April 2001	May 2001	June 2001	July 2001	August 2001
TVs								
Computer monitors								
Computer CPUs								
☞ Circle type of unit:	pounds	tons	number (quantity) of items					

6. How much of the following items do you expect to process in each of the years 2002-2006?

Product Type	2002	2003	2004	2005	2006
TVs					
Computer monitors					
Computer CPUs					
☞ Circle type of unit: pounds tons number (quantity) of items					

7. What factors are your processing projections based on? (Circle all that apply)

a. Extrapolation from past trends
b. Increase supply from landfills and other sources
c. Change in the economy
d. Sales data
e. Change in technology
f. Increased capacity at processing site
g. Decision to eliminate handling these materials
h. None of the above

8. What limits you from processing more televisions, computer monitors, and/or CPUs? (Circle all that apply)

a. Supply of TVs, computer monitors, and CPUs
b. Labor costs
c. Transportation costs
d. Other costs
e. Limitations on pass-along opportunities (e.g., brokers/traders, export market, smelters, etc.)
f. Storage capacity
g. Not in the business of processing e-waste
h. Difficulty in transportation and handling materials
i. Other

9. **What do you do with your product once you have finished with it?** (Circle all that apply)

   a. To export
   b. To smelter
   c. To glass-to-glass
   d. Other

10. **This survey will keep all of your information confidential.** However, we would like to be able to supplement the data you've supplied by contacting interested participants. If you are willing to speak with us further, please complete the following contact information.

    Name _____

    Processing Method(s) _____

    Telephone _____

    Email _____

If you are also a secondary processor, please move on to the next section

If you are done with the survey, please return it promptly:

- Via Fax: (916) 319-7299, to the attention of Mitch Delmage
- Via Mail:

  California Integrated Waste Management Board
  Special Waste Division, Executive Unit
  Attention Mitch Delmage
  1001 I Street
  P.O. Box 4025
  Sacramento, CA 95812

Thank you for your participation in this survey.

Secondary Processing Section

1. What is your maximum capacity to process each of the following items in calendar year 2001?
(Please circle the units that correspond to your answer)

Sample answer:	100,000	pounds	(tons)	TVs
a. Televisions	_____	pounds	tons	TVs
b. Computer monitors	_____	pounds	tons	computer monitors
c. TVs and monitors combined (if not tallied separately)	_____	pounds	tons	TVs and computer monitors
d. Computer CPUs	_____	pounds	tons	computer CPUs

2. What is the average total processing cost per unit to process the following?
(Please circle the units that correspond to your answer)

Sample answer:	$ 30	(per pound)	per ton	per TV	
a. Televisions	$_____	per pound	per ton	per TV	
b. Computer monitors	$_____	per pound	per ton	per computer monitor	
c. Computer CPUs	$_____	per pound	per ton	per computer CPU	

3. Which of the following processing costs do you predict will increase by 10 percent or more by 2006, not including the effects of general inflation?

a.	Labor costs	c.	Transportation costs
b.	Storage costs	d.	Technology costs

For Questions 4-6 please use the sample format below

Sample Answer

Product Type	***1996***	***1997***	***1998***	***1999***	***2000***
▪ ***TVs***	*Don't know*	*37,500*	*42,000*	*47,890*	*55,900*
▪ ***Computer monitors***	*Don't know*	*55,000*	*57,800*	*63,450*	*63,450*
▪ ***CPUs***	*0*	*0*	*0*	*0*	*0*
☞ *Circle type of unit:*	pounds	(tons)	number (quantity) of items		

4. How much of the following items did you process in each of the years 1996-2000?

Product Type	***1996***	***1997***	***1998***	***1999***	***2000***
▪ ***TVs***					
▪ ***Computer monitors***					
▪ ***Computer CPUs***					
☞ *Circle type of unit:*	pounds	tons	number (quantity) of items		

5. How much of the following items have you processed each month since the start of 2001?

Product Type	***January 2001***	***February 2001***	***March 2001***	***April 2001***	***May 2001***	***June 2001***	***July 2001***	***August 2001***
▪ ***TVs***								
▪ ***Computer monitors***								
▪ ***Computer CPUs***								
☞ *Circle type of unit:*	pounds	tons	number (quantity) of items					

6. How much of the following items do you expect to process in each of the years 2002-2006?

Product Type	*2002*	*2003*	*2004*	*2005*	*2006*
▪ ***TVs***					
▪ ***Computer monitors***					
▪ ***Computer CPUs***					
☞ *Circle type of unit:* pounds tons number (quantity) of items					

7. What factors are your processing projections based on? *(Circle all that apply)*

a. Extrapolation from past trends

b. Increase supply from landfills and other sources

c. Change in the economy

d. Sales data

e. Change in technology

f. Increased capacity at processing site

g. Decision to eliminate handling these materials

h. None of the above

8. What limits you from processing more televisions, computer monitors, and/or CPUs? *(Circle all that apply)*

a. Supply of TVs, computer monitors, and CPUs

b. Labor costs

c. Transportation costs

d. Other costs

e. Limitations on pass-along opportunities (e.g., brokers/traders, export market, smelters, etc.)

f. Storage capacity

g. Not in the business of processing e-waste

h. Difficulty in transportation and handling materials

i. Other

9. What do you do with your product once you have finished with it? *(Circle all that apply)*

a. To export

b. To smelter

c. To glass-to-glass

d. Other

10. This survey will keep all of your information confidential. However, we would like to be able to supplement the data you've supplied by contacting interested participants. If you are willing to speak with us further, please complete the following contact information.

Name _____

Processing Method(s) _____

Telephone _____

Email _____

If you are also a primary processor, please ensure that you have completed the first section.

If you are done with the survey, please return it promptly:

- Via Fax: (916) 319-7299, to the attention of Mitch Delmage
- Via Mail:

California Integrated Waste Management Board
Special Waste Division, Executive Unit
Attention Mitch Delmage
1001 I Street
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Sacramento, CA 95812

Thank you for your participation in this survey.

Appendix B

Processor Survey Results

The following is a summary of responses to the survey that was conducted of primary and secondary processors in September 2001. Throughout the survey responses, where the sum of the percentage exceeds 100 percent, respondents could select more than one answer.

Demographic Information

Total number of responses: 26

Response rate: 5.3%

Response rate from large processors: 61.5%
All large processors were contacted to determine whether or not they processed televisions.

Additional responses

- One response, representing statewide figures for a chain of thrift stores, was used for the quantitative analysis but not included in this summary.
- Two late responses were not included in the quantitative analysis, but were used in the general market analysis.

Percent of responses by business type

Product refurbish and resale	30.7%
Non-profit redistributor	15.4%
Raw materials recycler	7.7%
Refurbisher and raw materials recycler	19.2%
Thrift Store	27.0%

Percent of responses by geographic region

Northern California	15.4%
Central Valley	7.6%
Greater Bay Area	53.8%
Southern California	23.0%

Percent of responses by processing type and e-waste type

	Primary Processing	Secondary Processing
Televisions	34.6%	19.2%
Computer Monitors	80.8%	38.5%
Computer CPUs	88.5%	38.5%

Primary Processors

Total number of respondents that were involved in primary processing for at least one e-waste type: 24

Respondents' maximum capacity to process each of the following e-waste types in 2001

Televisions	317.0	tons
Computer monitors	9,419.0	tons
Computer CPUs	13,457.0	tons

Respondents' average total processing cost per ton to process each of the following in 2001

Televisions	$2,598	per ton
Computer monitors	$1,750	per ton
Computer CPUs	$1,513	per ton

Percentage of respondents that predicted the following processing costs would increase by 10 percent of more by 2006

Labor costs	100%
Storage costs	100%
Transportation costs	100%
Technology costs	100%

Volume of items respondents processed in each of the years 1996-2000 (in tons)

	1996	**1997**	**1998**	**1999**	**2000**
Televisions	163.0	169.5	185.8	276.8	326.2
Computer monitors	2,948.0	2,448.0	2,834.0	3,841.2	5,031.4
Computer CPUs	3,720.0	3,371.0	3,795.0	4,589.4	5,221.5

Volume of items respondents processed each month since the start of 2001 (in tons)

January	**February**	**March**	**April**	**May**	**June**	**July**	**August**
Televisions							
18.2	15.8	15.0	15.0	27.5	34.9	31.8	25.9
Computer Monitors							
448.0	395.2	390.1	366.1	374.0	329.2	317.3	345.6
Computer CPUs							
455.8	387.0	422.7	406.6	452.7	352.1	346.3	382.4

Volume of items respondents expect to process in each of the years 2002-2006 (in tons)

	2002	2003	2004	2005	2006
Televisions	291.8	311.3	356.0	363.3	391.8
Computer monitors	5,134.8	5,713.6	6,050.8	6,475.1	7,068.8
Computer CPUs	5,809.6	6,376.6	7,093.8	7,560.6	8,303.6

Percent of respondents who indicated the following factors as the basis for projections

Extrapolation from past trends	62.5%
Increase supply from landfills and other sources	37.5%
Change in the economy	25.0%
Sales data	4.2%
Change in technology	50.0%
Increased capacity at processing site	12.5%
Decision to eliminate handling these materials	25.0%
None of the above	8.3%

Percent of respondents that indicated the following as what limits them from to processing more TVs, monitors, and/or Computer CPUs

Supply of TVs, monitors, computer CPUs	29.2%
Transportation costs	45.8%
Labor costs	37.5%
Limitations on pass-along opportunities	41.6%
Storage capacity	37.5%
Not in the business of processing e-waste	25.0%
Difficulty in transportation and handling materials	20.8%
Other costs	33.3%
Other	16.6%

Percent of respondents that do the following with their product once they have finished with it

To export	33.3%
To smelter	33.3%
To glass-to-glass	12.5%
Other	75.0%

Secondary Processors

Total number of respondents that were involved in secondary processing for at least one e-waste type: 14

Respondents' maximum capacity to process each of the following e-waste types in 2001

Televisions	3,783.0 tons
Computer monitors	34,719.0 tons
Computer CPUs	19,989.0 tons

Respondents' average total processing cost per ton to process each of the following in 2001

Televisions	$1,676 per ton
Computer monitors	$1,089 per ton
Computer CPUs	$701 per ton

Percentage of respondents that predicted the following processing costs would increase by 10 percent of more by 2006

Labor costs	100.0%
Storage costs	100.0%
Transportation costs	100.0%
Technology costs	100.0%

Volume of items respondents processed in each of the years 1996-2000 (in tons)

	1996	1997	1998	1999	2000
Televisions	0.0	0.0	4.0	9.5	68.4
Computer monitors	552.0	798.5	1,200.5	2,264.5	4,177.5
Computer CPUs	3,143.5	3,571.0	4,010.0	4,670.0	5,182.5

Volume of items respondents processed each month since the start of 2001 (in tons)

January	February	March	April	May	June	July	August
Televisions							
14.0	16.0	11.0	15.5	33.5	51.1	51.6	66.2
Computer Monitors							
338.4	280.9	274.1	227.9	250.4	214.3	201.8	211.8
Computer CPUs							
414.1	332.7	386.9	349.1	392.4	271.8	268.0	292.1

Volume of items respondents expect to process in each of the years 2002-2006 (in tons)

	2002	2003	2004	2005	2006
Televisions	1,250.5	1,375.0	1,600.0	1,750.0	2,000.5
Computer monitors	3,361.3	3,636.3	3,657.5	3,845.0	3,982.5
Computer CPUs	5,086.3	5,536.3	5,857.5	6,445.0	6,982.5

Percent of respondents who indicated the following factors as the basis for projections:

Extrapolation from past trends	57.1%
Increase supply from landfills and other sources	57.1%
Change in the economy	50.0%
Sales data	7.1%
Change in technology	78.6%
Increased capacity at processing site	21.4%
Decision to eliminate handling these materials	14.3%
None of the above	7.1%

Percent of respondents that indicated the following as what limits them from processing more TVs, monitors, and/or Computer CPUs:

Supply of TVs, monitors, computer CPUs	28.6%
Transportation costs	85.7%
Labor costs	57.1%
Limitations on pass-along opportunities	35.7%
Storage capacity	50.0%
Not in the business of processing e-waste	7.1%
Difficulty in transportation and handling materials	42.9%
Other costs	57.1%
Other	21.4%

Percent of respondents that do the following with their product once they have finished with it

To export	42.9%
To smelter	64.3%
To glass-to-glass	42.9%
Other	71.4%

Appendix C

Processors Contacted

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
A/C Industrial Services Co.	O	Chico	Butte
Access Computer Parts	P	Canoga Park	Los Angeles
Ace Auto and Scrap	S	San Francisco	San Francisco
Ace Loan Office	O	San Jose	Santa Clara
Act for Mental Health	O	San Jose	Santa Clara
Adaptive Computer Empowerment Services	X	San Diego	San Diego
Alameda County Computer Resource Center	B	Oakland	Alameda
Alameda County Computer Resource Center (Marin)	B	Novato	Marin
Aleph Electronics	O	San Leandro	Alameda
All Computer Resource	P	San Jose	Santa Clara
All Laser	O	Sunnyvale	Santa Clara
Allied Electronic Recovery	B	Hayward	Alameda
Allied Electronic Recovery	X	Union City	Alameda
Alltech Electronics	P	Lomita	Los Angeles
Alltech Electronics	P	Santa Ana	Orange
Alltronics	P	San Jose	Santa Clara
American Metal and Iron	P	San Jose	Santa Clara
Anaheim Goodwill Donation Center	P	Santa Ana	Orange
Apollo Business Machines	O	San Francisco	San Francisco
ARC of Butte County	O	Chico	Butte
Atlantic Computer Group	P	Santa Clara	Santa Clara
Attic, The	P	Oroville	Butte
Baras Foundation	P	San Diego	San Diego
Bay Area Data Supply Inc.	O	Sunnyvale	Santa Clara

* These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Bay City Recycling	O	San Jose	Santa Clara
Belmont Trading West	S	Hayward	Alameda
Berkeley Neighborhood Computers	O	Berkeley	Alameda
Berman's Diversified Industries	B	San Jose	Santa Clara
Berman's Diversified Industries	X	San Jose	Santa Clara
Best Metals Process	O	San Jose	Santa Clara
BFI (Ox Mountain Landfill)	O	Half Moon Bay	San Mateo
BFI—San Carlos Transfer Station	O	San Carlos	San Mateo
Blue Star Electronics, LLC.	B	Santa Clara	Santa Clara
Book Buyers	O	Mountain View	Santa Clara
Books for the Barrios	X	Concord	Contra Costa
Brethren Christ Community Church	P	Ontario	San Bernardino
Buenas Vidas Youth Ranch Thrift	O	Livermore	Alameda
Butterick Enterprises	O	San Jose	Santa Clara
Buyers Consultation Service	P	Canoga Park	Los Angeles
C & E and Computer Recycling Co	B	Santa Rosa	Sonoma
C & H Electronic Recovery	B	Fremont	Alameda
C.U.R.A Inc.	X	Oakland	Alameda
California Area Resources for Education (CARE)	O	Sacramento	Sacramento
California Computer Exchange	X	Petaluma	Sonoma
California Electronic Asset Recovery	P	Sacramento	Sacramento
California Human Development Co.	S	Santa Rosa	Sonoma
CCS	O	Upland	San Bernardino
Center for Employment Training	X	Santa Rosa	Sonoma
Chico Computers for Schools	P	Chico	Butte

* These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Circosta Iron & Metal	O	San Francisco	San Francisco
CJ Seto	O	Ventura	Ventura
Clark Business Machines	O	Berkeley	Alameda
Community Computer Center Inc.	P	San Francisco	San Francisco
Community Value	P	San Jose	Santa Clara
Computer Circulation Center	B	Oceanside	San Diego
Computer Jones Warehouse	P	Santa Cruz	Santa Cruz
Computer Outlet Worldwide, Inc.	O	Tustin	Orange
Computer Recycling Center	B	Santa Clara	Santa Clara
Computer Recycling Center, San Francisco	B	San Francisco	San Francisco
Computer Recycling Center, Palm Springs	B	Palm Desert	Riverside
Computer Recycling Center, Santa Clara	X	Santa Clara	Santa Clara
Computer Recycling Project	P	Stockton	San Joaquin
Computer Recycling Project	X	San Francisco	San Francisco
Computers & You	P	San Francisco	San Francisco
Computers 4 Less	P	Santa Rosa	Sonoma
Computers and More	B	Santa Rosa	Sonoma
Creative Re-Use	P	Santa Rosa	Sonoma
Crisis Computer	P	San Jose	Santa Clara
CURA, Inc.	B	Fremont	Alameda
Curtis Trading Co.	X	Milpitas	Santa Clara
Curtis Trading Co.	X	San Jose	Santa Clara
Dave's Computer Services	P	Santa Cruz	Santa Cruz
Davis Street Transfer Station	O	San Leandro	Alameda
Del Norte Regional Computer and Electronics Recycling and Transfer Station	O	Oxnard	Ventura
DigiQuest Learning Center	O	San Rafael	Marin

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Disabled American Veterans	P	San Diego	San Diego
E. Zak & Co. Used Office Equip.	P	San Jose	Santa Clara
Eclectic Computer Services	P	Santa Clara	Santa Clara
Ecological Technologies	O	Sunnyvale	Santa Clara
ECS Refining	B	Santa Clara	Santa Clara
Ed's Television	X	Santa Rosa	Sonoma
Electronics Museum of the Perha	O	Los Altos	Santa Clara
Equipment Recycling Services	X	Rocklin	Placer
Euro Pak International	X	Burbank	San Mateo
Federal Asset Recovery	S	Sacramento	Sacramento
Fidelity Industries Incorporated	S	Sacramento	Sacramento
Fox Electronics	S	San Jose	Santa Clara
Freon Free	O	Suisun City	Solano
Fry's Electronics	O	San Jose	Santa Clara
Garbage Reincarnation, Inc.	P	Santa Rosa	Sonoma
GC Enterprises	X	Trabuco Canyon	Orange
Gold'n West Surplus	B	Corona	Riverside
Goldstar Computer Recycling	S	Fremont	Alameda
Goodwill	P	Alameda	Alameda
Goodwill	P	Hayward	Alameda
Goodwill	P	Livermore	Alameda
Goodwill	P	Napa	Napa
Goodwill	P	San Leandro	Alameda
Goodwill	P	Oakland	Alameda
Goodwill	P	Berkeley	Alameda
Goodwill	P	Capitola	Santa Cruz

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Goodwill	P	Santa Cruz	Santa Cruz
Goodwill	P	Watsonville	Santa Cruz
Goodwill	P	Santa Rosa	Sonoma
Goodwill	P	Healdsburg	Sonoma
Goodwill CPU Clearance Center	P	Covina	Los Angeles
Goodwill Donation Center, City Heights	P	San Diego	San Diego
Goodwill Donation Center, Costa Mesa	P	Costa Mesa	Orange
Goodwill Donation Center, Huntington Beach	P	Huntington Beach	Orange
Goodwill Donation Center, Lake Forest	P	Lake Forest	Orange
Goodwill Donation Center, Old Town	P	San Diego	San Diego
Goodwill Donation Center, San Ysidro	P	San Diego	San Diego
Goodwill Donation Center, Westminster	P	Westminster	Orange
Goodwill Industries	P	Los Angeles	Los Angeles
Goodwill Industries	P	Los Angeles	Los Angeles
Goodwill Industries	P	Los Angeles	Los Angeles
Goodwill Industries	P	Los Angeles	Los Angeles
Goodwill Industries	P	Los Feliz	Los Angeles
Goodwill Industries	P	Los Angeles	Los Angeles
Goodwill Industries	P	Los Angeles	Los Angeles
Goodwill Industries	P	Los Angeles	Los Angeles
Goodwill Industries	P	Los Angeles	Los Angeles
Goodwill Industries	P	Hollywood	Los Angeles
Goodwill Industries	P	Compton	Los Angeles
Goodwill Industries	P	Gardena	Los Angeles
Goodwill Industries	P	Redondo Beach	Los Angeles

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Goodwill Industries	P	Redondo Beach	Los Angeles
Goodwill Industries	P	Torrance	Los Angeles
Goodwill Industries	P	Whittier	Los Angeles
Goodwill Industries	P	La Mirada	Los Angeles
Goodwill Industries	P	Lakewood	Los Angeles
Goodwill Industries	P	Hawaiian Gardens	Los Angeles
Goodwill Industries	P	Lomita	Los Angeles
Goodwill Industries	P	Paramount	Los Angeles
Goodwill Industries	P	Wilmington	Los Angeles
Goodwill Industries	P	Carson	Los Angeles
Goodwill Industries	P	Long Beach	Los Angeles
Goodwill Industries	P	Long Beach	Los Angeles
Goodwill Industries	P	Long Beach	Los Angeles
Goodwill Industries	P	Long Beach	Los Angeles
Goodwill Industries	P	Tujunga	Los Angeles
Goodwill Industries	P	Pasadena	Los Angeles
Goodwill Industries	P	Glendale	Los Angeles
Goodwill Industries	P	Glendale	Los Angeles
Goodwill Industries	P	Canoga Park	Los Angeles
Goodwill Industries	P	Northridge	Los Angeles
Goodwill Industries	P	Reseda	Los Angeles
Goodwill Industries	P	San Fernando	Los Angeles
Goodwill Industries	P	Saugus	Los Angeles
Goodwill Industries	P	Thousand Oaks	Los Angeles
Goodwill Industries	P	Panorama City	Los Angeles

▾These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Goodwill Industries	P	Panorama City	Los Angeles
Goodwill Industries	P	Sherman Oaks	Los Angeles
Goodwill Industries	P	Van Nuys	Los Angeles
Goodwill Industries	P	N Hollywood	Los Angeles
Goodwill Industries	P	Azusa	Los Angeles
Goodwill Industries	P	Upland	San Bernardino
Goodwill Industries	P	West Covina	Los Angeles
Goodwill Industries	P	Chula Vista	San Diego
Goodwill Industries	P	Imperial Beach	San Diego
Goodwill Industries	P	El Cajon	San Diego
Goodwill Industries	P	Escondido	San Diego
Goodwill Industries	P	Oceanside	San Diego
Goodwill Industries	P	Vista	San Diego
Goodwill Industries	P	San Diego	San Diego
Goodwill Industries	P	San Diego	San Diego
Goodwill Industries	P	San Diego	San Diego
Goodwill Industries	P	San Ysidro	San Diego
Goodwill Industries	P	San Ysidro	San Diego
Goodwill Industries	P	San Ysidro	San Diego
Goodwill Industries	P	Indio	Riverside
Goodwill Industries	P	Cathedral City	Riverside
Goodwill Industries	P	Palm Springs	Riverside
Goodwill Industries	P	Fontana	San Bernardino
Goodwill Industries	P	San Bernardino	San Bernardino
Goodwill Industries	P	Riverside	Riverside

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Goodwill Industries	P	Riverside	Riverside
Goodwill Industries	P	Hemet	Riverside
Goodwill Industries	P	Huntington Beach	Orange
Goodwill Industries	P	Santa Ana	Orange
Goodwill Industries	P	Santa Ana	Orange
Goodwill Industries	P	Santa Ana	Orange
Goodwill Industries	P	Anaheim	Orange
Goodwill Industries	P	Fullerton	Orange
Goodwill Industries	P	Fullerton	Orange
Goodwill Industries	P	Orange	Orange
Goodwill Industries	P	Orange	Orange
Goodwill Industries	P	Ventura	Ventura
Goodwill Industries	P	Camarillo	Ventura
Goodwill Industries	P	Moorpark	Ventura
Goodwill Industries	P	Oxnard	Ventura
Goodwill Industries	P	Santa Paula	Ventura
Goodwill Industries	P	Simi Valley	Ventura
Goodwill Industries	P	Santa Barbara	Santa Barbara
Goodwill Industries	P	Delano	Kern
Goodwill Industries	P	Visalia	Tulare
Goodwill Industries	P	Bakersfield	Kern
Goodwill Industries	P	Bakersfield	Kern
Goodwill Industries	P	Bakersfield	Kern
Goodwill Industries	P	Bakersfield	Kern
Goodwill Industries	P	Bakersfield	Kern
Goodwill Industries	P	San Luis Obispo	San Luis Obispo

▾These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Goodwill Industries	P	San Luis Obispo	San Luis Obispo
Goodwill Industries	P	Atascadero	San Luis Obispo
Goodwill Industries	P	Grover Beach	San Luis Obispo
Goodwill Industries	P	El Paso Robles	San Luis Obispo
Goodwill Industries	P	Santa Maria	Santa Barbara
Goodwill Industries	P	Lancaster	Los Angeles
Goodwill Industries	P	Palmdale	Los Angeles
Goodwill Industries	P	Ridgecrest	Kern
Goodwill Industries	P	Clovis	Fresno
Goodwill Industries	P	Madera	Madera
Goodwill Industries	P	Fresno	Fresno
Goodwill Industries	P	Fresno	Fresno
Goodwill Industries	P	Salinas	Monterey
Goodwill Industries	P	Salinas	Monterey
Goodwill Industries	P	Monterey	Monterey
Goodwill Industries	P	Seaside	Monterey
Goodwill Industries	P	Burlingame	San Mateo
Goodwill Industries	P	Daly City	San Mateo
Goodwill Industries	P	Menlo Park	San Mateo
Goodwill Industries	P	Mountain View	Santa Clara
Goodwill Industries	P	S. San Francisco	San Mateo
Goodwill Industries	P	Sunnyvale	Santa Clara
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	San Francisco	San Francisco

* These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	San Francisco	San Francisco
Goodwill Industries	P	Palo Alto	Santa Clara
Goodwill Industries	P	San Mateo	San Mateo
Goodwill Industries	P	Antioch	Contra Costa
Goodwill Industries	P	Benicia	Solano
Goodwill Industries	P	Concord	Contra Costa
Goodwill Industries	P	Pleasant Hill	Contra Costa
Goodwill Industries	P	Fairfield	Solano
Goodwill Industries	P	Hayward	Alameda
Goodwill Industries	P	Pinole	Contra Costa
Goodwill Industries	P	Pittsburg	Contra Costa
Goodwill Industries	P	Dublin	Alameda
Goodwill Industries	P	Rodeo	Contra Costa
Goodwill Industries	P	San Leandro	Alameda
Goodwill Industries	P	Cordelia	Solano
Goodwill Industries	P	Vallejo	Solano
Goodwill Industries	P	Oakland	Alameda
Goodwill Industries	P	Oakland	Alameda
Goodwill Industries	P	Oakland	Alameda
Goodwill Industries	P	Richmond	Contra Costa
Goodwill Industries	P	El Sobrante	Contra Costa

* These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Goodwill Industries	P	San Rafael	Marin
Goodwill Industries	P	Campbell	Santa Clara
Goodwill Industries	P	Gilroy	Santa Clara
Goodwill Industries	P	Milpitas	Santa Clara
Goodwill Industries	P	Morgan Hill	Santa Clara
Goodwill Industries	P	Santa Clara	Santa Clara
Goodwill Industries	P	Santa Cruz	Santa Cruz
Goodwill Industries	P	Santa Cruz	Santa Cruz
Goodwill Industries	P	San Jose	Santa Clara
Goodwill Industries	P	San Jose	Santa Clara
Goodwill Industries	P	San Jose	Santa Clara
Goodwill Industries	P	San Jose	Santa Clara
Goodwill Industries	P	San Jose	Santa Clara
Goodwill Industries	P	San Jose	Santa Clara
Goodwill Industries	P	Stockton	San Joaquin
Goodwill Industries	P	Stockton	San Joaquin
Goodwill Industries	P	Stockton	San Joaquin
Goodwill Industries	P	Lodi	San Joaquin
Goodwill Industries	P	Manteca	San Joaquin
Goodwill Industries	P	Merced	Merced
Goodwill Industries	P	Modesto	Stanislaus
Goodwill Industries	P	Tracy	San Joaquin
Goodwill Industries	P	Turlock	Stanislaus
Goodwill Industries	P	Santa Rosa	Sonoma
Goodwill Industries	P	Santa Rosa	Sonoma
Goodwill Industries	P	Sonoma	Sonoma
Goodwill Industries	P	Ukiah	Mendocino

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Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Goodwill Industries	P	Auburn	Placer
Goodwill Industries	P	Carmichael	Sacramento
Goodwill Industries	P	Citrus Heights	Sacramento
Goodwill Industries	P	Dixon	Solano
Goodwill Industries	P	North Highlands	Sacramento
Goodwill Industries	P	Vacaville	Solano
Goodwill Industries	P	West Sacramento	Sacramento
Goodwill Industries	P	Woodland	Yolo
Goodwill Industries	P	Sacramento	Sacramento
Goodwill Industries	P	Sacramento	Sacramento
Goodwill Industries	P	Sacramento	Sacramento
Goodwill Industries	P	Chico	Butte
Goodwill Industries	P	Yuba City	Sutter
Hackett Enterprises	B	San Jose	Santa Clara
Healdsburg Transfer Station	O	Healdsburg	Sonoma
Heckman Metals Co.	X	East Palo Alt	San Mateo
HMR Group	B	San Francisco	San Francisco
HMR Inc.	X	San Francisco	San Francisco
Hope Rehabilitation Service	O	Santa Clara	Santa Clara
Hyran International Group, Inc.	O	Temple City	Los Angeles
Intellesale.com	X	Hayward	Alameda
J & B Enterprises	O	Santa Clara	Santa Clara
James Electronics	P	Belmont	San Mateo
KidSource Online: Computing EDGE Program	P	San Jose	Santa Clara
Koop, Boneyard Computers	B	Eureka	Humboldt

* These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
L.A. Shares	P	Los Angeles	Los Angeles
Lake County Transfer Station	O	Lake Port	Lake
Laser Logic Inc.	O	San Jose	Santa Clara
Lighting Resources, Inc.	O	Ontario	San Bernardino
Mac and More Computers	P	Santa Cruz	Santa Cruz
Mac Community Comp.	P	Soquel	Santa Cruz
Magik, Inc.	X	San Francisco	San Francisco
Magik, Inc.	X	Emeryville	Alameda
Marin Computer Resource	X	San Rafael	Marin
Marin Computer Resource Center	X	Novato	Marin
Martin's Recycling, Inc.	O	Gilroy	Santa Clara
MBA Polymers	O	Richmond	Contra Costa
M-Cubed	B	Sunnyvale	Santa Clara
Metal Brokers Inc.	S	San Jose	Santa Clara
Metals Diversion International	X	San Leandro	Alameda
Metals Reclamation Service	O	San Jose	Santa Clara
Metech International	B	Gilroy	Santa Clara
Micro Metallic Corporation	S	San Jose	Santa Clara
Mint Computer Resources	O	Santa Cruz	Santa Cruz
MonitorGuy.Com	P	Commerce	Los Angeles
New Life Computer Foundation	X	Woodland Hills	Los Angeles
NorCal Reclamation	X	Santa Clara	Santa Clara
Norcal Waste Systems	X	Oroville	Butte
Oakland Technical Exchange	P	Oakland	Alameda
On Balance, Inc.	P	Walnut Creek	Contra Costa
Ox-Mountain Sanitary Landfill	O	Half Moon Bay	San Mateo

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Pacific Coast Recycling	O	San Jose	Santa Clara
Palo Alto Microcomputer	P	Palo Alto	Santa Clara
Pinole-Rodeo Auto Wreck	O	Rodeo	Contra Costa
Pleasant Hill Recycling	S	Concord	Contra Costa
Polymer Recovery Services	S	Santa Clara	Santa Clara
Printers and More	P	Petaluma	Sonoma
Product Stewardship Corporation	P	San Diego	San Diego
Puyam Corporation	S	Lancaster	Los Angeles
Quality New and Used Computers	B	Campbell	Santa Clara
Quantum Resource Recovery	O	Beaverton	(Oregon)
Quick Recycling Center	X	San Jose	Santa Clara
RA Enterprises	X	Santa Clara	Santa Clara
RAFT - Resource Area for Teachers	B	San Jose	Santa Clara
Rapid Micro Distribution	P	San Diego	San Diego
Recycletown	O	Petaluma	Sonoma
Recycletown	X	Rio Nido	Sonoma
Recycling Depot	X	Santa Clara	Santa Clara
Recycling Specialists Inc.	O	San Jose	Santa Clara
Renew Computers	P	San Rafael	Marin
Resources Recyclers International	X	San Francisco	San Francisco
Roslan Integrated, Inc.	P	San Jose	Santa Clara
Salesco Systems USA	O	Phoenix	(Arizona)
Salvage 1 Recycling	S	Brea	Orange
Salvation Army	P	Los Angeles	Los Angeles
Salvation Army	P	Los Angeles	Los Angeles
Salvation Army	P	Culver City	Los Angeles
Salvation Army	P	Downey	Los Angeles

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Salvation Army	P	Lawndale	Los Angeles
Salvation Army	P	Redondo Beach	Los Angeles
Salvation Army	P	Santa Monica	Los Angeles
Salvation Army	P	Torrance	Los Angeles
Salvation Army	P	Whittier	Los Angeles
Salvation Army	P	Buena Park	Orange
Salvation Army	P	Norwalk	Los Angeles
Salvation Army	P	Lakewood	Los Angeles
Salvation Army	P	San Pedro	Los Angeles
Salvation Army	P	Long Beach	Los Angeles
Salvation Army	P	Long Beach	Los Angeles
Salvation Army	P	Pasadena	Los Angeles
Salvation Army	P	Pasadena	Los Angeles
Salvation Army	P	Glendale	Los Angeles
Salvation Army	P	Canoga Park	Los Angeles
Salvation Army	P	Newbury Park	Los Angeles
Salvation Army	P	San Fernando	Los Angeles
Salvation Army	P	North Hills	Los Angeles
Salvation Army	P	Canyon Country	Los Angeles
Salvation Army	P	Sun Valley	Los Angeles
Salvation Army	P	Van Nuys	Los Angeles
Salvation Army	P	No. Hollywood	Los Angeles
Salvation Army	P	City of Industry	Los Angeles
Salvation Army	P	Covina	Los Angeles
Salvation Army	P	Upland	San Bernardino

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Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Salvation Army	P	El Monte	Los Angeles
Salvation Army	P	Pomona	Los Angeles
Salvation Army	P	Chula Vista	San Diego
Salvation Army	P	Spring Valley	San Diego
Salvation Army	P	El Cajon	San Diego
Salvation Army	P	Escondido	San Diego
Salvation Army	P	Santee	San Diego
Salvation Army	P	Vista	San Diego
Salvation Army	P	Sunnyvale	Santa Clara
Salvation Army	P	San Diego	San Diego
Salvation Army	P	San Diego	San Diego
Salvation Army	P	San Diego	San Diego
Salvation Army	P	Pacific Beach	San Diego
Salvation Army	P	San Diego	San Diego
Salvation Army	P	Cathedral City	Riverside
Salvation Army	P	Fontana	San Bernardino
Salvation Army	P	Redlands	San Bernardino
Salvation Army	P	Victorville	San Bernardino
Salvation Army	P	San Bernardino	San Bernardino
Salvation Army	P	Highland	San Bernardino
Salvation Army	P	San Bernardino	San Bernardino
Salvation Army	P	Riverside	Riverside
Salvation Army	P	Hemet	Riverside
Salvation Army	P	Hemet	Riverside
Salvation Army	P	Moreno Valley	Riverside
Salvation Army	P	Perris	Riverside

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Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Salvation Army	P	Temecula	Riverside
Salvation Army	P	Costa Mesa	Orange
Salvation Army	P	Lake Forest	Orange
Salvation Army	P	Garden Grove	Orange
Salvation Army	P	Huntington Beach	Orange
Salvation Army	P	San Clemente	Orange
Salvation Army	P	Westminster	Orange
Salvation Army	P	Santa Ana	Orange
Salvation Army	P	Santa Ana	Orange
Salvation Army	P	Anaheim	Orange
Salvation Army	P	Anaheim	Orange
Salvation Army	P	Santa Ana	Orange
Salvation Army	P	Fullerton	Orange
Salvation Army	P	Garden Grove	Orange
Salvation Army	P	Corona	Riverside
Salvation Army	P	Ventura	Ventura
Salvation Army	P	Camarillo	Ventura
Salvation Army	P	Carpinteria	Ventura
Salvation Army	P	Oxnard	Ventura
Salvation Army	P	Simi Valley	Ventura
Salvation Army	P	Santa Barbara	Santa Barbara
Salvation Army	P	Delano	Kern
Salvation Army	P	Hanford	Kings
Salvation Army	P	Porterville	Tulare
Salvation Army	P	Shafter	Kern
Salvation Army	P	Visalia	Tulare

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Salvation Army	P	Bakersfield	Kern
Salvation Army	P	Bakersfield	Kern
Salvation Army	P	Bakersfield	Kern
Salvation Army	P	Lompoc	Santa Barbara
Salvation Army	P	Lancaster	Los Angeles
Salvation Army	P	Lancaster	Los Angeles
Salvation Army	P	Palmdale	Los Angeles
Salvation Army	P	Clovis	Fresno
Salvation Army	P	Clovis	Fresno
Salvation Army	P	Madera	Madera
Salvation Army	P	Reedley	Fresno
Salvation Army	P	Fresno	Fresno
Salvation Army	P	Fresno	Fresno
Salvation Army	P	Salinas	Monterey
Salvation Army	P	Seaside	Monterey
Salvation Army	P	Belmont	San Mateo
Salvation Army	P	Redwood City	San Mateo
Salvation Army	P	San Bruno	San Mateo
Salvation Army	P	South San Francisco	San Mateo
Salvation Army	P	San Francisco	San Francisco
Salvation Army	P	San Francisco	San Francisco
Salvation Army	P	San Francisco	San Francisco
Salvation Army	P	San Francisco	San Francisco
Salvation Army	P	San Francisco	San Francisco
Salvation Army	P	San Francisco	San Francisco
Salvation Army	P	San Francisco	San Francisco

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Salvation Army	P	San Francisco	San Francisco
Salvation Army	P	San Francisco	San Francisco
Salvation Army	P	East Palo Alto	San Mateo
Salvation Army	P	Antioch	Contra Costa
Salvation Army	P	Benicia	Solano
Salvation Army	P	Concord	Contra Costa
Salvation Army	P	Pleasant Hill	Contra Costa
Salvation Army	P	Fairfield	Solano
Salvation Army	P	Fremont	Alameda
Salvation Army	P	Livermore	Alameda
Salvation Army	P	Napa	Napa
Salvation Army	P	Napa	Napa
Salvation Army	P	Dublin	Alameda
Salvation Army	P	San Leandro	Alameda
Salvation Army	P	Vallejo	Solano
Salvation Army	P	Vallejo	Solano
Salvation Army	P	Hayward	Alameda
Salvation Army	P	Oakland	Alameda
Salvation Army	P	Berkeley	Alameda
Salvation Army	P	Albany	Alameda
Salvation Army	P	Richmond	Contra Costa
Salvation Army	P	San Pablo	Contra Costa
Salvation Army	P	San Rafael	Marin
Salvation Army	P	Rohnert Park	Sonoma
Salvation Army	P	Rohnert Park	Sonoma
Salvation Army	P	Novato	Marin
Salvation Army	P	Petaluma	Sonoma

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Salvation Army	P	Petaluma	Sonoma
Salvation Army	P	Capitola	Santa Cruz
Salvation Army	P	Gilroy	Santa Clara
Salvation Army	P	Hollister	San Benito
Salvation Army	P	Santa Cruz	Santa Cruz
Salvation Army	P	Santa Cruz	Santa Cruz
Salvation Army	P	Santa Cruz	Santa Cruz
Salvation Army	P	Watsonville	Santa Cruz
Salvation Army	P	Watsonville	Santa Cruz
Salvation Army	P	Watsonville	Santa Cruz
Salvation Army	P	San Jose	Santa Clara
Salvation Army	P	San Jose	Santa Clara
Salvation Army	P	San Jose	Santa Clara
Salvation Army	P	San Jose	Santa Clara
Salvation Army	P	Santa Clara	Santa Clara
Salvation Army	P	Stockton	San Joaquin
Salvation Army	P	Lodi	San Joaquin
Salvation Army	P	Manteca	San Joaquin
Salvation Army	P	Modesto	Stanislaus
Salvation Army	P	Oakdale	Stanislaus
Salvation Army	P	Sonora	Tuolumne
Salvation Army	P	Turlock	Stanislaus
Salvation Army	P	Santa Rosa	Sonoma
Salvation Army	P	Santa Rosa	Sonoma
Salvation Army	P	Santa Rosa	Sonoma
Salvation Army	P	Santa Rosa	Sonoma
Salvation Army	P	Santa Rosa	Sonoma

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Salvation Army	P	Healdsburg	Sonoma
Salvation Army	P	McKinleyville	Humboldt
Salvation Army	P	Arcata	Humboldt
Salvation Army	P	Eureka	Humboldt
Salvation Army	P	Fortuna	Humboldt
Salvation Army	P	Auburn	Placer
Salvation Army	P	Davis	Yolo
Salvation Army	P	Citrus Heights	Sacramento
Salvation Army	P	Woodland	Yolo
Salvation Army	P	Sacramento	Sacramento
Salvation Army	P	Marysville	Yuba
Salvation Army	P	Chico	Butte
Salvation Army	P	Chico	Butte
Salvation Army	P	Grass Valley	Nevada
Salvation Army	P	Oroville	Butte
Salvation Army	P	Paradise	Butte
Salvation Army	P	Redding	Shasta
Salvation Army	P	Redding	Shasta
Salvation Army	P	Redding	Shasta
Salvation Army	P	Red Bluff	Tehama
Salvation Army	P	Orange	Orange
San Francisco Educational Services	X	San Francisco	San Francisco
San Joaquin, County of	S	Lodi	San Joaquin
San Jose Family Shelter	O	San Jose	Santa Clara
San Jose Metals	O	San Jose	Santa Clara
Savers-Thrift Store	P	San Jose	Santa Clara
Shelter Hill Computer Learning Center	P	Mill Valley	Marin

*These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Silicon Salvage	S	Anaheim	Orange
Simsmetal America	O	Richmond	Contra Costa
Simsmetal America	O	San Jose	Santa Clara
Simsmetal America	S	Redwood City	San Mateo
Simsmetal America	X	Hayward	Alameda
SoCal Recyclers	B	Hawthorne	Los Angeles
Software Recovery Svc.	X	Hayward	Alameda
South Bay Metals, Inc.	O	Gilroy	Santa Clara
SPIRIT Alliance, Folsom Cordova USD	O	Folsom	Sacramento
St. Vincent de Paul Soc.	P	Daly City	San Mateo
St. Vincent de Paul Soc.	P	Mountain View	Santa Clara
St. Vincent de Paul Soc.	P	S. San Francisco	San Mateo
St. Vincent de Paul Soc.	P	San Mateo	San Mateo
St. Vincent de Paul Soc.	P	Alameda	Alameda
St. Vincent de Paul Soc.	P	Brentwood	Contra Costa
St. Vincent de Paul Soc.	P	Pleasant Hill	Contra Costa
St. Vincent de Paul Soc.	P	Livermore	Alameda
St. Vincent de Paul Soc.	P	Fremont	Alameda
St. Vincent de Paul Soc.	P	Oakland	Alameda
St. Vincent de Paul Soc.	P	Berkeley	Alameda
St. Vincent de Paul Soc.	P	Boulder Creek	Santa Cruz
St. Vincent de Paul Soc.	P	Santa Cruz	Santa Cruz
St. Vincent de Paul Soc.	P	San Jose	Santa Clara
St. Vincent de Paul, Golden Hill	P	San Diego	San Diego
St. Vincent de Paul, Market Street	P	San Diego	San Diego
St. Vincent de Paul, South Bay	P	San Diego	San Diego

* These businesses were no longer in business, or their telephones were disconnected and new information could not be found.

Organization	Category Primary (P) Secondary (S) Both (B) Other (O) No Data (X)*	City	County
Steve Randall and Company	O	Orangevale	Sacramento
STRUT	O	Portland	(Oregon)
Technalloy Inc.	O	San Jose	Santa Clara
Thrift City	O	San Jose	Santa Clara
Tom's Computer Warehouse	B	Berkeley	Alameda
Toner Products Ltd.	X	Los Altos	Santa Clara
Tri-Cities Waste Management	O	Fremont	Alameda
Tung Tai Group	S	San Jose	Santa Clara
Tung Tai Group	S	Burlingame	San Mateo
United Datatech Distributors	B	San Jose	Santa Clara
United Salvage	P	San Jose	Santa Clara
United Way of Sonoma-Mendocino	O	Santa Rosa	Sonoma
Universal Refining Services	S	San Jose	Santa Clara
Urban Ore	O	Berkeley	Alameda
Urban Ore, Inc.	O	Berkeley	Alameda
Usedlaptops.com	B	Mountain View	Santa Clara
Valley Gold & Silver Exchange	O	San Jose	Santa Clara
Valley Recycling	O	San Jose	Santa Clara
VP Electronics	B	Stockton	San Joaquin
VP Electronics, Inc.	X	San Jose	Santa Clara
Weird Stuff Warehouse	P	Sunnyvale	Santa Clara
Wiesco Recycling	X	Danville	Contra Costa
Wyse's Technology	P	San Jose	Santa Clara
Youth for Service	O	San Francisco	San Francisco
Youth For Service	O	San Francisco	San Francisco
Zak Enterprises	S	Santa Clara	Santa Clara
Zanker Road Resource Management	X	San Jose	Santa Clara

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Appendix D

Results of Survey of California Residents

The following are the questions and answers to The Field Institute survey conducted in September 2001 of 1,003 Californians.

Question #1: How many televisions do you have in storage and are no longer being used?	
	Responses
None	81.5%
1 television	13.0%
2 televisions	3.9%
3 or more televisions	1.6%
Total	**100%**
Total percentage of non-stockpilers	81.5%
Total percentage of stockpilers	18.5%
Total	**100%**

Question #2: How many computer monitors do you have in storage and are no longer being used?	
	Responses
None	80.6%
1 monitor	13.9%
2 monitors	2.7%
3+ monitors	2.8%
Total	**100%**
Total percentage of non-stockpilers	80.6%
Total percentage of stockpilers	19.4%
Total	**100%**

Question #3: What did you do with the last television that you had when you stopped using it?

Note: Question #3 was asked only of those subjects who stated in Question #1 that they are **not** storing any televisions. In other words, this question was asked of 81.5 percent of the sample, or 417 people of the 512 in the split sample.

	Responses	
	As a percentage of non-stockpilers	**Number of responses**
Gave it away to friend, relative, charity	43.4%	181
Threw it out in trash	20.1%	84
Still using it/ never disposed of it	12.9%	54
Sold it at a yard sale, to a neighbor	5.5%	23
Took it to dump	2.9%	12
Gave it to repair shop, TV dealer, or retailer	2.2%	9
Never owned one	1.7%	7
Gave to recycling center/recycled it	1.2%	5
Don't know	7.0%	29
Other	3.1%	13
Total	**100.0%**	**417**

Question #4: What are some of the reasons that you decided to stop using the television(s) that you now have in storage?

Note: Question #4 was asked only of those subjects who stated in Question #1 that they **are** storing a television. In other words, this question was asked of 18.5 percent of the sample, or 95 people of the 512 in the split sample.

	Responses	
	As a percent of stockpilers	**Number of responses**
Got a bigger, better, newer model/too old, small, outdated/cable access	32.6%	31
It broke/didn't work properly	24.2%	23
We have multiple units/not enough room/it was an extra	21.1%	20
Never watched it/wasn't using it	14.7%	14
Other	7.4%	7
Total	**100.0%**	**95**

Question #5: What did you do with the last monitor that you had when you stopped using it?

Note: Question #5 was asked only of those subjects who stated in Question #2 that they are not storing any monitors. In other words, this question was asked of 80.6 percent of the sample, or 396 people of the 491 in the split sample.

	Responses	
	As a percentage of non-stockpilers	**Number of responses**
Gave it to friend, family, charity	29.8%	118
Never owned one	25.3%	100
Still using it/never disposed of it	21.2%	84
Threw it away/dump	5.1%	20
Sold it	1.8%	7
Traded for faster, upgrade	1.0%	4
Still waiting to hook it up	0.3%	1
Other	7.1%	28
Don't know	8.6%	34
Total	**100.0%**	**396**

Question #6: What are some of the reasons that you decided to stop using the monitor(s) that you now have in storage?

Note: Question #6 was asked only of those subjects who stated in Question #2 that they **are** storing a monitor. In other words, this question was asked of 19.4 percent of the sample, or 95 people of the 491 in the split sample.

	Responses	
	As a percentage of stockpilers	**Number of responses**
Outdated, slow, old/needed to be upgraded/bought newer model to replace	63.2%	60
It broke/didn't work, died	18.9%	18
Screen size too small/got bigger one	7.4%	7
Lost interest/boring/stopped using	6.3%	6
Other	4.2%	4
Total	**100.0%**	**95**

Question #7: Would knowing this make you very likely, somewhat likely, or not likely to move a stored television or computer out of storage?				
	Responses			
	Very likely	Some-what likely	Not likely	Don't know
Learning that there is a drop-off center in your area where you can go to dispose of a stored television or computer monitor	46.5%	26.5%	23.3%	3.7%
Learning that there is a place in your area where you can take a stored television or computer monitor to have it refurbished for donation	56.6%	26.0%	13.2%	4.2%
Learning that you can dispose of a stored television or computer monitor by placing it at curbside for pick-up by a local recycling agency	50.7%	20.2%	26.0%	3.2%

Appendix E

Processing Cost Estimates for 2006 Diverted E-Waste

Projected Range of Cost to Handle the Total Volume of Diverted E-Waste in 2006 (in millions and in 2006 dollars)

	Primary Processing	Secondary Processing	Cost to Handle Total 2006 Volume
Televisions	$12.0 – $17.2	$3.9♦	$15.9 – $21.1
Monitors	$45.7 – $83.3	$17.1 – $24.4	$62.8 – $107.7
CPUs	$33.6 – $45.6	$10.4 – $24.8	$44.0 – $70.4

♦ See footnote on page 7 for an explanation of why this value is not presented as a range.

Appendix F

Additional Resources

Publications

Contact information for agencies referenced below is in the section entitled "Organizations, Agencies, and Initiatives."

Computers, E-Waste, and Product Stewardship: Is California Ready for the Challenge? Report for the United States Environmental Protection Agency, Region IX, prepared by the Global Futures Foundation, June 2001.

Disposition and End-of-Life Options for Personal Computers, H. Scott Matthews, Pacific Northwest Pollution Prevention Resource Center, Technical Report #97-10, July 1997.

Electronic Product Recovery and Recycling Baseline Report: Recycling of Selected Electronic Products in the United States, National Safety Council, May 1999.

End-of-Life Consumer Electronic and Electrical Products in the Alameda County and City of San Francisco Municipal Waste Streams: An Investigation of Models for Community Economic Development, a study sponsored by the Alameda County Waste Authority and the Recycling Board and the San Francisco City Recycling Program, May 1999.

A Guide to Environmentally Preferable Computer Purchasing, Northwest Product Stewardship Council Computer Subcommittee, October 2000.

Managing Waste Cathode Ray Tubes, California Environmental Protection Agency, Department of Toxic Substances Control, Fact Sheet, August 2001.

Poison PCs and Toxic TVs: California's biggest environmental crisis that you've never heard of," a joint project of: Californians Against Waste, The Next Generation, Silicon Valley Toxics Coalition, and The Materials for the Future Foundation, June 19, 2001.

Presentations of the Electronic Product Recovery and Recycling (EPR2) and Electronics Recycling Summit: *Cathode Ray Tube Manufacturing and Recycling: Analysis of Industry Survey*, Electronics Industries Alliance, Spring 2001.

Recycling Used Electronics, A Report on Minnesota's Demonstration Project, Minnesota Office of Environmental Assistance, July 2001.

Residential Collection of Household End-of-Life Electrical and Electronic Equipment, a Pilot Collection Project, United States Environmental Protection Agency, Region I, EPA-901-R-98-002, February 1998.

WasteWise Update: Electronic Reuse and Recycling, United States Environmental Protection Agency, EPA530-N-00-007, October 2000.

Plastics from Residual Electronics Recycling, American Plastics Council, January 2000.

Recovery of Plastics From Municipally Collected Electrical and Electronic Goods, American Plastics Council and The Materials for the Future Foundation, March 1999.

Organizations, Agencies, and Initiatives

American Electronics Association
5201 Great America Parkway
Santa Clara, CA 94054
408-987-4200
http://aeanet.org/

Californians Against Waste
926 J Street, 6th Floor
Sacramento, CA 95814
(916) 443-5422
www.cawrecycles.org

California Integrated Waste Management Board
1001 I Street
PO Box 4025
Sacramento, CA 95812
(916) 341-6000
www.ciwmb.ca.gov

Carnegie Mellon University: Green Design Initiative
5000 Forbes Avenue
Pittsburgh, PA 15213-3890
(412) 268-6218
http://gdi.ce.cmu.edu

Department of Toxic Substances Control
1001 I Street
PO Box 806
Sacramento, CA 95812
www.dtsc.ca.gov

Electronic Industries Alliance
2500 Wilson Blvd.
Arlington, VA 22201
www.eia.org/

Global Futures Foundation
25 Maiden Lane, 6th Floor
San Francisco, CA 94108
(415) 248.0011
www.globalfutures.org

GrassRoots Recycling Network
P.O. Box 49283
Athens, GA 30604-9283
(706) 613-7121
www.grrn.org

International Association of Electronics Recyclers
P.O. Box 16222
Albany, NY 12212-6222
(888) 989-4237
www.iaer.org/

The Materials for the Future Foundation
PO Box 29091
San Francisco, CA 94129
(415) 561-6530
www.materials4future.org

Minnesota Office of Environmental Assistance
520 Lafayette Rd. N.
St. Paul, MN 55155-4100
www.moea.state.mn.us

National Electronic Product Stewardship Initiative (NEPSI)
www.nepsi.org

National Safety Council
1025 Connecticut Avenue, NW, Suite 1200
Washington, DC 20036
(202) 293-2270
www.nsc.org

Product Stewardship Institute
UMASS/Lowell
Pinanski Building, Room 303
One University Avenue
Lowell, MA 01854
(978) 934-4855
www.turi.org/product_stewardship/index.html

Silicon Valley Toxics Coalition,
Campaign for Responsible Technology
760 N. First Street
San Jose, CA 95112
(408) 287-6707
www.svtc.org

U.S. Environmental Protection Agency
www.epa.gov/epahome/

Western Electronic Product Stewardship Initiative (WEPSI)
P.O. Box 6736
Portland OR 97228-6736
(503) 644-0294
www.recyclingadvocates.org/wepsi

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Cathode Ray Tube Manufacturing and Recycling: Analysis of Industry Survey, presentation to Electronic Product Recovery and Recycling and Electronics Recycling Summit, Arlington, Virginia, Spring 2001.

Collection Organizations Directory, International Association of Electronics Recyclers, <http://www.iaer.org/search/iaersearch.cfm>.

Computers, E-Waste, and Product Stewardship: Is California Ready for the Challenge?: A Menu of Policy Options for Computer Extended Product Responsibility, Report for the U.S. Environmental Protection Agency Region IX, Global Futures Foundation, 2001.

Current Population Survey Internet and Computer Use Supplement, U.S. Department of Labor/Bureau of Labor Statistics and U.S. Census Bureau. August 2000, <http://ferret.bls.census.gov>.

Digital Television Tower Siting Fact Sheet, Frequently Asked Questions and RF Guide, Federal Communications Commission, <http://www.fcc.gov/mmb/prd/dtv/>.

DP-1. Profile of General Demographic Characteristics: 2000, U.S. Census Bureau, <http://factfinder.census.gov/bf/_lang=en_vt_name=DEC_2000_SF1 _U_DP1_geo _id=04000US06.html>.

Electronic Product Recovery and Recycling Baseline Report: Recycling of Selected Electronic Products in the United States, National Safety Council Environmental Health Center, Washington, DC, May 1999.

Electronics Recycling.Net, Electronics Industry Alliance, <http://www.electronicsrecycling .net/menu2/search/eiasearch.asp?state=CA>.

End-of-Life Consumer Electronic and Electrical Products in the Alameda County and City of San Francisco Municipal Waste Streams: An Investigation of Models for Community Economic Development, Materials for the Future Foundation, Steve Holroyd and Associates, May 1999.

Letter to Ms. Sheila Davis, Materials for the Future Foundation, from Peggy Harris, Department of Toxic Substances Control, March 20, 2001.

National Database of Electronics Recyclers, Reuse Organizations, and Municipal Programs, National Recycling Coalition, <http://www.nrc-recycle.org/Programs /electronics/search /getlisting.asp>.

News Release: Consumer Price Index: August 2001, U.S. Department of Labor/Bureau of Labor Statistics, August 2001, <http://www.bls.gov/news.release/pdf/cpi.pdf>.

Notification Requirements for CRT Material Handlers, 22 CCR Section 66273.82, August 2001.

Poison PCs and Toxic TVs: California's Biggest Environmental Crisis that You've Never Heard Of, Silicon Valley Toxics Coalition, Californians Against Waste, Materials for the Future Foundation, June 2001.

Recycled and Refurbished Hardware, Techsoup.Org, <http://www.techsoup.org /resourcelist.cfm?resourcelistid=10&showall=1>.

Recycling Used Electronics: Report on Minnesota's Demonstration Project, Minnesota Office of Environmental Assistance, St. Paul, July 2001.

Smulders, Charles, Gartner Research, phone conference, October 10, 2001.

Smulders, Charles, Gartner Research, spreadsheet of sales forecasts e-mailed, October 17, 2001.

State and County QuickFacts, U.S. Census Bureau, <http://quickfacts.census.gov /qfd/states/06000.html>.

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[2] *Poison PCs and Toxic TVs: California's Biggest Environmental Crisis that You've Never Heard Of,* Silicon Valley Toxics Coalition, Californians Against Waste, Materials for the Future Foundation, June 2001, pp. 9-10.

[3] Letter to Ms. Sheila Davis, Materials for the Future Foundation, from Peggy Harris, Department of Toxic Substances Control, Sacramento, March 20, 2001.

[4] *Electronics Recycling.Net*, Electronics Industry Alliance, <http://www.electronicsrecycling.net /menu2/search/eiasearch.asp?state=CA>; *Recycled and Refurbished Hardware*, Techsoup.Org, <http://www.techsoup.org/resourcelist .cfm?resourcelistid=10&showall=1>; *Collection Organizations Directory*, International Association of Electronics Recyclers, <http://www.iaer.org/search/iaersearch.cfm>; *National Database of Electronics Recyclers, Reuse Organizations, and Municipal Programs*, National Recycling Coalition, <http://www.nrc-recycle.org /Programs /electronics/search /getlisting.asp>.

[5] *Current Population Survey Internet and Computer Use Supplement*, U.S. Department of Labor/Bureau of Labor Statistics and U.S. Census Bureau, August 2000, <http://ferret.bls.census.gov>.

[6] *Electronic Product Recovery and Recycling Baseline Report: Recycling of Selected Electronic Products in the United States*, National Safety Council Environmental Health Center, Washington, DC, May 1999, p. 15.

[7] *News Release: Consumer Price Index: August 2001*, U.S. Department of Labor/Bureau of Labor Statistics, August 2001, <http://www.bls.gov/news.release/pdf/cpi.pdf>.

[8] *DP-1. Profile of General Demographic Characteristics: 2000*, U.S. Census Bureau, <http://factfinder.census.gov/bf/_lang=en_vt_name=DEC_2000_SF1_U_DP1_geo_id= 04000US06.html>.

[8] *Electronic Product Recovery and Recycling Baseline Report: Recycling of Selected Electronic Products in the United States*, National Safety Council Environmental Health Center, Washington, DC, May 1999, pp. 29-33.

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[15] Ibid.

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